THE PAPER INDUSTRY and PAPER WORLD

VOLUME 22
NUMBER 8
NOVEMBER, 1940

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THE BWH Rotocure Process of Continuous Vulcanization is the only practical method of producing uniform rubber belting entirely free from press overlaps. It solves the problem because the belting is processed on an exclusive patented rotary type of press, radical in principle. It substitutes uniformity for variation by making the vulcanizing process automatic instead of spasmodic. Uniformity results not from the skill or experience of the operator, but from the unvarying precision of the machine. The result: a uniform belt uniformly vulcanized and uniformly stretched, that will give uniform service.

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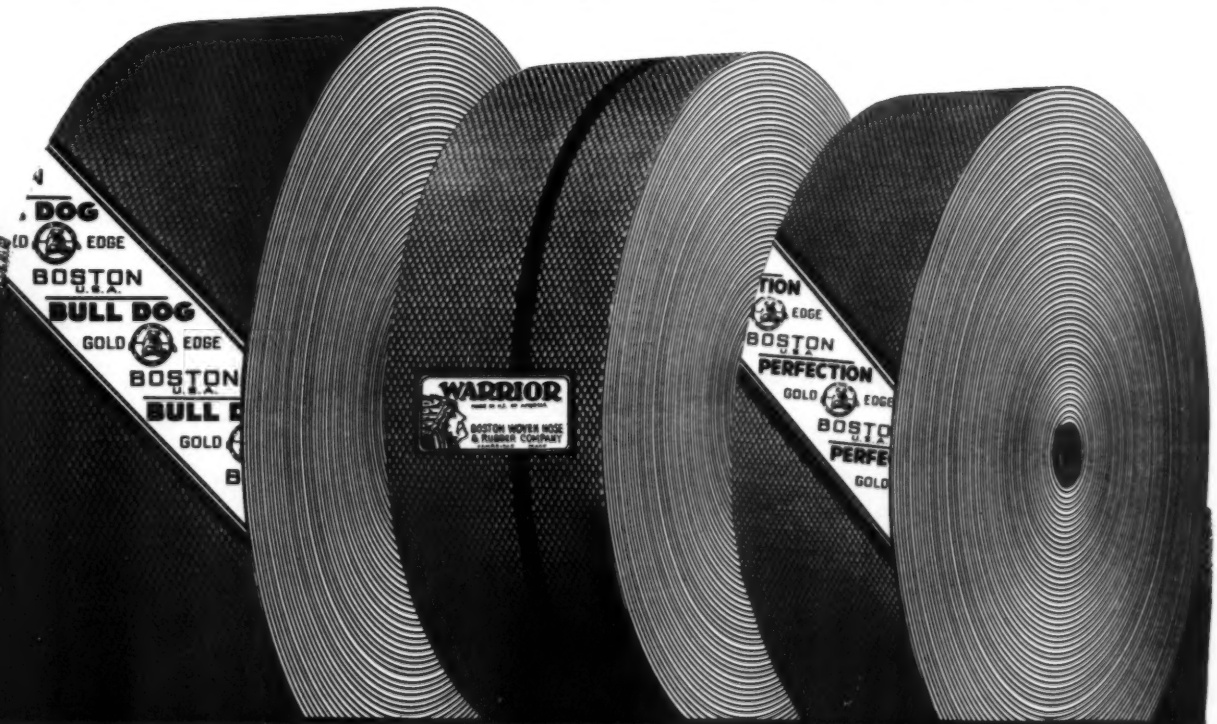
BETTER BELTS



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***from* GASES**

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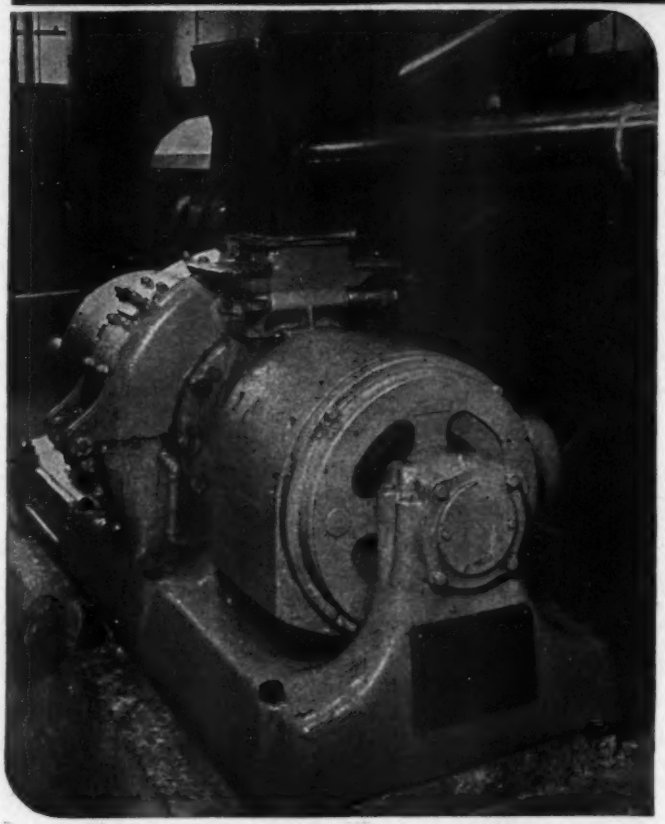
Now A 24" BAUER PULPER



24" Bauer Pulper installed at Toronto Mill of Gair Co., Canada, Ltd.

The ideal machine for board mill liner stocks. Complete defibering with positive control of freeness.

Multiple installations for large tonnages or wide variety of grades give maximum operating flexibility.

● Also highly adaptable for kraft, sulphite, and groundwood reject refining in the smaller mills.

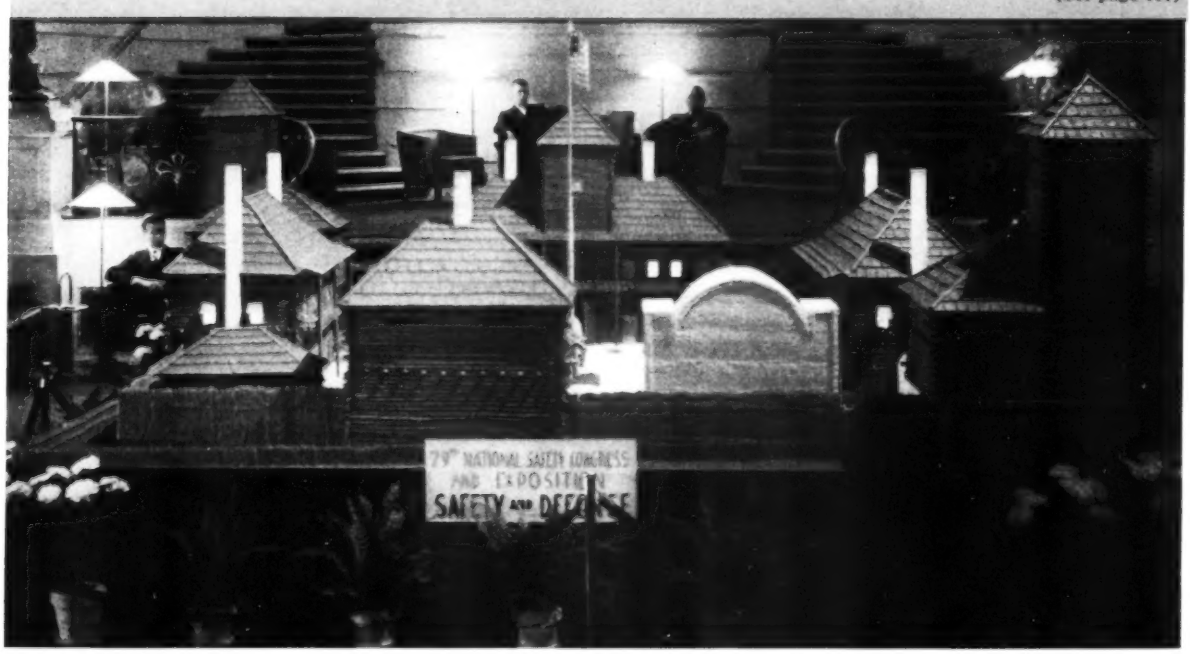
THE BAUER BROS. CO. SPRINGFIELD, OHIO

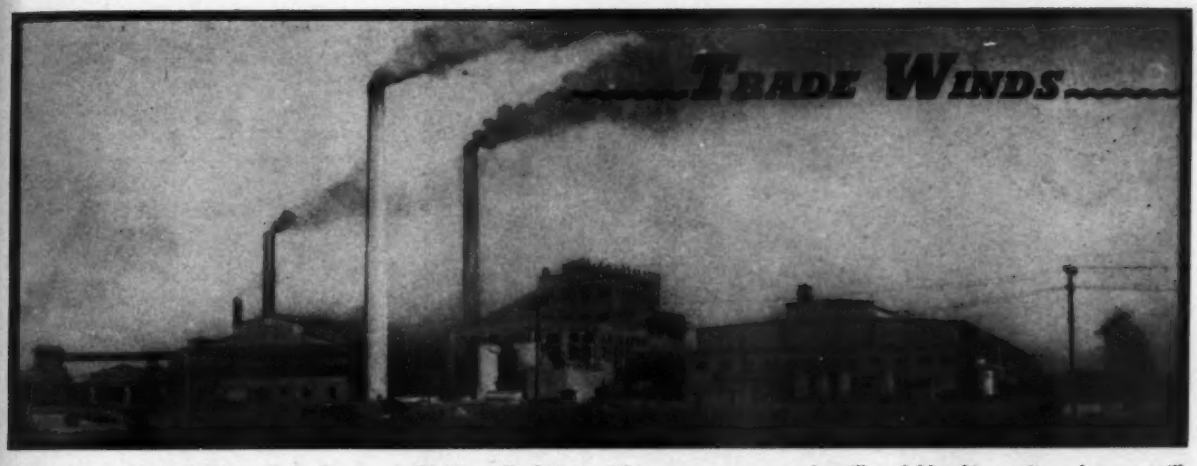
Safety Is Defense--

Defense Is Safety

In the pioneer days of this country, men built strong forts to protect their families from harm. But as their numbers increased and progress led them into many new fields of business and industry, it no longer was necessary for men to protect their people from savages. . . . Then another menace reared its head. Their new world had many hazards which took lives. The study of the prevention of accidents and protection from many industrial ills became known as SAFETY, and today the emblem of Universal Safety is known everywhere. . . . Defense and Safety are so correlated that one must depend upon the other to be highly efficient. National Defense, or preparedness against invasion, must be carried on under the most rigid rules of safe practice. Safety, in its broadest sense, is the very essence of that which protects the people of this country from anything that threatens injury or aggression.

(See page 807)



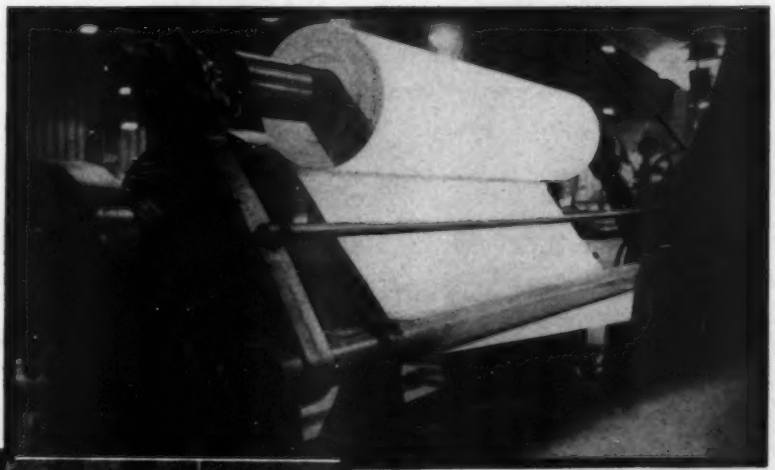


View from rear of Southern Kraft Company's Mobile mill. Left to right: recovery room, pulp mill and bleaching unit, and paper mill.

Developments at Mobile Plant of *Southern Kraft*

▸▸▸ A NEW BLEACHING UNIT adjoining the large pulp mill of the Southern Kraft Corporation's Mobile (Alabama) mill is in operation. The first bleached sulphate paper was made in this plant during the first part of October, and supreme organization within the plant was manifested when the first reel of white paper from the new unit was found suitable for conversion into paper bags.

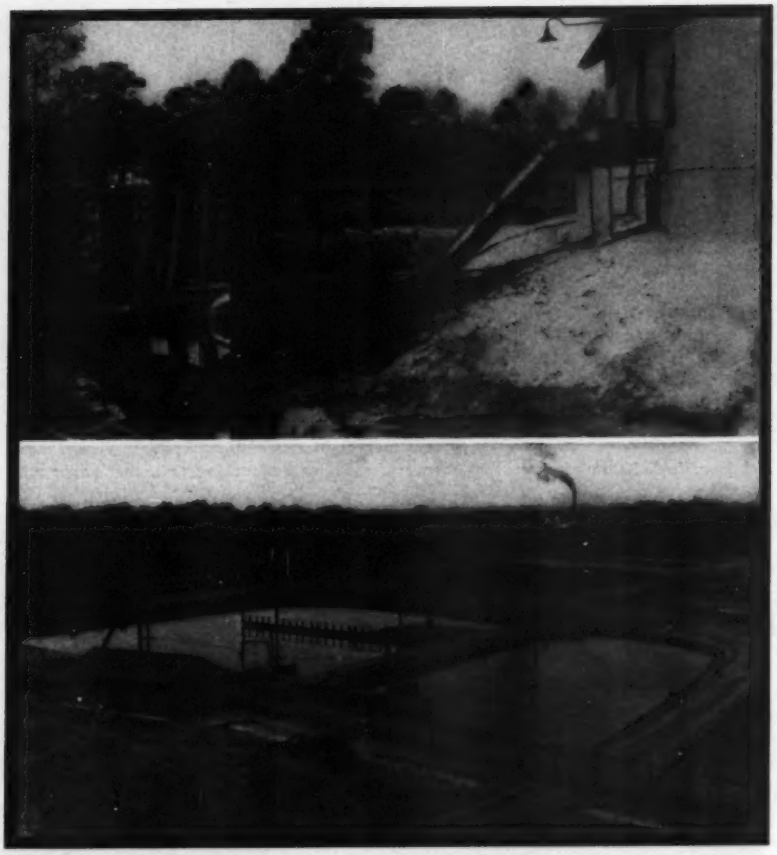
The unit is two-stage and has a capacity of forty tons of bone-dry pulp each twenty-four hours. The stock used is all Southern pine, taken directly from the pulp mill to the first stage of the unit where it is treated with chlorine, washed, sent to the second stage, therein treated with bleaching liquor, washed again, then piped to the stock chest from which the paper mill draws.



Above—One of the first reels of white paper made in this mill. This paper was made on the No. 4 machine.
Left—Close-up of bleaching unit.

According to C. S. Maybre, chief chemist of the Mobile mill, this unit could almost be called a duplicate of the bleach plant installed several years ago in Southern Kraft's Moss Point, (Mississippi) mill.

To date, the white paper is being made only on the plant's No. 4 machine, a 130-inch Yankee, although most of



Left—Lines drawing water from Bayou Sara. Right—The two new reservoirs.

the paper has been of standard machine finish.

The unit was designed by the company engineers, S. S. McGill being in charge of construction, assisted by C. W. Ward. W. P. Davis is the company's chief engineer.

Water for the bleaching plant and an additional supply for the mill is supplied by a new pumping station recently constructed by the company and which went into operation at approximately the same time as the bleaching unit. This station is on Bayou Sara and has a twenty-four inch line conveying water six miles to the mill. The water is drawn from the middle of a bend in the bayou by an eighteen-inch line which is supported by a small dock running from the pumping station to the point of descension. The Allis Chalmers centrifugal pump is driven by a 200 hp. electric d-c. motor with a speed of 1140 r.p.m. and delivers to the mill nearly nine million gallons of water each day, 6,000 g.p.m.

Side by side are two of these pumps, motors and lines to the bayou, one always ready for emergency use. No help is required to stay at the station, only for intermittent checkups, as everything is handled by remote control from the mill, six miles distant.

For the new supply of water, the company has placed two new reservoirs on the grounds, the receiving reservoir having a capacity of one million gallons. A series of baffles calm the water as it enters the reservoir in a turbulent stage, the baffles also serving to mix the chemicals, alum and lime, which reduce the *p*H from 5.6 to 5.5; these chemicals also precipitating all vegetable matter in the water. From here the water is pumped to the other pond, then on to the mill supply room.

◆

ST. REGIS CO. ACQUIRES ALL SUBSIDIARIES

Effective October 1, 1940, the St. Regis Kraft Company, Panelyte Corporation and the New Hampshire-Vermont Lumber Company—all subsidiaries of the St. Regis Paper Company—were dissolved and the assets acquired by the St. Regis Paper Company. Hereafter, says the announcement, these properties will be operated as divisions of the St. Regis Paper Company. There will be no change in the policies or conduct of the business with customers and other business connections.

HOLYOKE'S SEA WALL COMPLETED

The $1,000,000 flood protection wall in Holyoke, Massachusetts, which was built for the protection of paper and other industries along the Connecticut River, has been completed. The sea wall is hailed by manufacturers who for a period of years have suffered tremendous losses when the river had abnormal rises or floods.

The wall extends from a point at the Holyoke dam to Mosher Street in Holyoke and as soon as funds are appropriated by the federal government, it will be extended from Mosher Street to the Springdale dike located at the southerly entrance to Holyoke. The wall was built under the direction of the war department engineers headed by Carl S. Lovejoy (cf THE PAPER INDUSTRY AND PAPER WORLD, p. 1024, Jan. 1939). There are four pumping stations in the wall, designed primarily to discharge any leakage that might result from extremely high water. The first two stations have two 24-inch pumps, the other two have 30-inch pumps. The wall will afford complete protection against any flood up to the famous 1936 level when industries were crippled for months by high waters.

Only for the wall many industries in Holyoke might have moved from the city since mill owners felt that they no longer could stand the tremendous losses resulting from shutdowns as well as damage to their property.

◆

ESTIMATE BIG PULPWOOD CUT IN CANADA

Pulpwood operations in Canada and Newfoundland will be on a much more extensive scale than heretofore, according to reports from the Dominion.

In Newfoundland, Bowater's will cut in excess of 400,000 cords and Cornerbrook will cut 320,000 cords plus 80,000 for export. There are 43 camps cutting wood for the Cornerbrook mill at present with 1,500 men employed. Cut of pit props will be substantially reduced because of the increased demand for pulpwood.

From Quebec's Saguenay region comes news that about 12,000 men will be used to cut wood for three paper companies operating in the district. These firms will cut about one million cords. The list is topped by Price Brothers and Company with a 600,000 cord advance estimate. Consolidated Paper expects to cut 300,000 cords and the Lake St. John Power and Paper Company will cut 200,000 cords.

"Who sent you in, kid?"

...ASKS THE HALFBACK ON PAGE 33 OF THE KID FROM PAGE 34

"TIME OUT, PLEASE," says the Kid.

"What is this . . . a nursery squad?" growls the Half, "Get off the field."

"I'd like to go home to the next page," the Kid settles down comfortably, "but I can't. I'm *show through.*"

"Ow-w-w-w, an All-Star game," the Half groans, "and we get a paper substitute!"

"Steady, old man, why don't you write the paper mill?"

"I didn't get that signal," the Half tries scratching an ear through his helmet. "What's your play?"

"This paper is holding up your game. Right?" the Kid demands, "So you get the paper manufacturer and Krebs people together. Those Krebs pigments will send me home. They make even the thinnest papers opaque."

"You're a broken field runner with ideas, kid. And this is according to Hoyle?"

"Cleanest play you ever made. You ought to see how white and bright those Krebs Pigments make the paper . . . sharp and clear printing on both sides."

"We have to do something quick," says the Half.

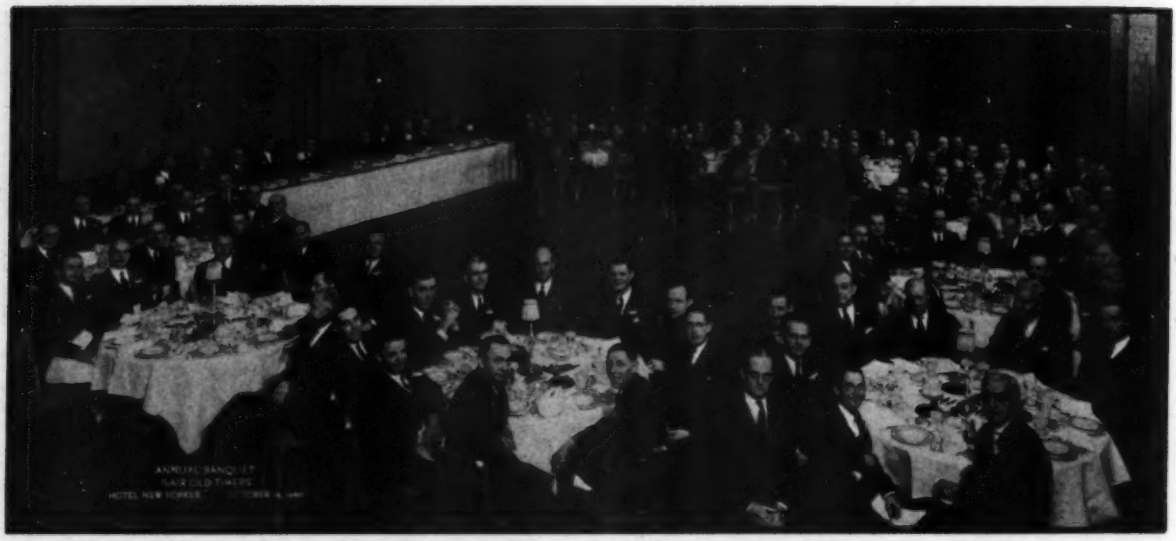
"They're easy to use," says the Kid, "and the Krebs people cooperate with technical information."

". . . with only a minute left to play!"

"Less than a minute," the Kid comes back, "will write that letter."

KREBS PIGMENT & COLOR CORP.

1007 Orange Street, Wilmington, Delaware



GAIR "OLD TIMERS" HOLD ANNUAL DINNER MEETING

One of the most unique organizations in the paper industry—the Gair Old Timers Association—met on October 19 at the Hotel New Yorker for its eighth annual dinner.

This association, which is without dues, individual responsibilities or benefits, was organized in 1933 to honor the memory of Robert Gair, Founder of the Robert Gair Company, Inc., and to renew old friendships between present and former employees of ten years' standing in Mr. Gair's organization. In 1937 the association erected a bronze memorial plaque to Mr. Gair's memory.

In charge of the 1940 dinner were Charles F. Stocker of the Sweeney Lithograph Company and Frank McCormick of the Gair Cartons Division, Piermont, New York. During the past year the association lost five of its representative members.

At the dinner this year Lawrence Beattie, Gair Realty Corporation, was elected honorary president and Paul Lang, plant manager of the Continental Folding Box Company, was elected president. Walter E. Ringle, sales department, Robert Gair Company was named vice president and H. B. Van Antwerp, of Sinclair & Valentine Company, was re-elected secretary and treasurer. There are 400 members in the Gair Old Timers Association.

TO INVESTIGATE ABITIBI AFFAIRS

The judicial sale of the assets and undertakings of Abitibi Power and Paper Company, Ltd., held in Toronto on October 16, proved abortive when a bid of $30,000,000, the sole bid submitted, was under the reserve bid set by the court. The bid was submitted on the part of H. J. Symington, chairman of the bankholders' protective committee on behalf of the committee. Following the close of the bidding and the master's announcement, lawyers present stated that the plaintiff had the alternative of asking either for another sale, with a lower reserve bid, or of asking for a sale with no reserve bid.

Following the failure of the sale of the Abitibi assets, Premier Hepburn of Ontario appointed a three-man Royal commission to investigate the affairs of the company and recommended to the Ontario Government a plan of reorganization which will be equitable to all interests concerned. The investigation began on November 4.

◆

AUSTRALIA IS STILL BUYING B. C. NEWSPRINT

Purchases of British Columbia newsprint by Australian producers is continuing in accordance with the 7-year contract signed in 1937 with Canadian mills but the volume has been severely contracted owing to the rationing regulations now in effect in the Commonwealth.

Powell River Company and Pacific Mills, Ltd., are contributing about one-quarter of all Canada's shipments to Australia under this contract.

Australia is buying pulp in British Columbia for its Derwent Valley paper project as it is required as a blend with Australian native woods. Volume of pulp shipments from both the Powell River and Ocean Falls is not likely to be curtailed owing to Australia's policy of developing the use of domestic newsprint to as great an extent as possible.

◆

OLD HINDE AND DAUCH PROPERTY REPORTED SOLD

Reports that the lands and buildings of the old Hinde and Dauch Paper Company at Delphos, Ohio, now belongs to the St. Marys Packing Company, have been circulated recently. The property, which some years ago was sold to the Albemarle-Chesapeake Paper Company, was reported to have changed hands again with the transfer to the St. Marys firm.

According to reports, the paper-making equipment is to be removed so that the building may be used as a warehouse by the packing company whose main plant at Delphos is near the paper mill.

◆

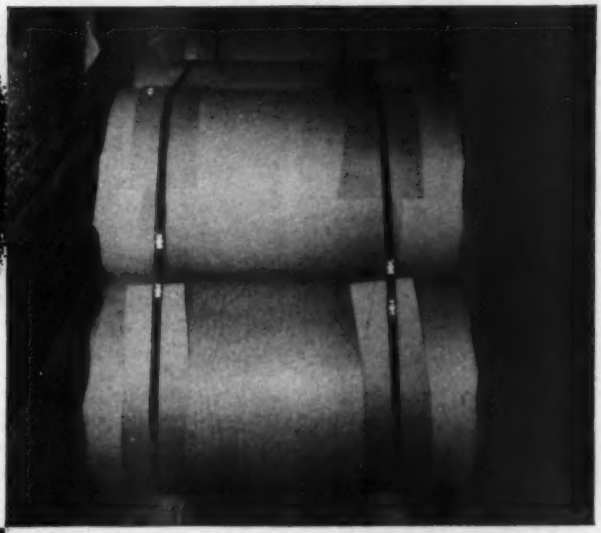
LITTLE DAMAGE IN SORG FIRE

Fire which broke out recently in the Sorg Paper Company's Smith mill, Middletown, Ohio, destroyed some pulp in storage but was confined to only one section of the plant, it was reported recently. All electrical and steam power was cut off as a safety measure and no equipment was damaged. The Smith division resumed operations within a few days and none of the other units of the company were affected.

HOW YOU CAN MAKE

Paper Shipments FASTER, SAFER MORE ECONOMICALLY

THERE IS AN ACME PROCESS TO MEET EVERY PAPER SHIPPING PROBLEM



THE NEW ACME SKID-CHECK PROCESS

was developed to meet the problem of chafing in transit. Oscillation of the individual rolls is prevented by this scientific and proved remedy.

Mail the coupon below for complete facts of the application of this new paper bracing method.

ACME SKID-LOAD PROCESS MAKES POSSIBLE IMPORTANT SAVINGS

Directly above and above right are interesting applications of the Acme Skid-Load Process. This scientific shipping method provides adequate protection to individual skids, as well as carloads at minimum cost. Customer satisfaction is assured. Damage-free arrival is a surety. Shipping and handling costs are cut . . . time and warehouse space are saved. The coupon below will give you all the facts.

ACME UNIT-LOAD PROCESS FOR CARLOAD AND L. C. L. SHIPMENTS

(right) Every shipment is "bound to get there" when the Acme Unit-Load Process is used. Unnecessary and costly bracing materials are eliminated—freight charges are substantially reduced (less tare weight). There is no danger of damaged shipments—resultant claims are eliminated and customer goodwill is increased. Be sure to get all the details on this simple, inexpensive bracing procedure.

Mail the coupon today for complete information on these cost-cutting Acme Processes. It is yours without obligation—and may suggest several ways in which you can make important savings.

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2851 Archer Ave., Chicago, Illinois

- ☐ Send full details on the Acme Skid-Check Method
- ☐ Mail a copy of the Acme Unit-Load Booklet
- ☐ Send a copy of "Stopping Profit Leaks Beyond the Production Line"

Name.....

Address.....

City.....*State*.....

WASHINGTON

COMPLETE ROSTER PAPER INDUSTRY DEFENSE COMM.

The Defense Committee of the Paper and Pulp Industry has been completed with a membership including every field in the industry. This committee, an official means of establishing contact between the Industry and the Advisory Commission to the National Defense Council.

The committee is headed by Ralph A. Hayward of the Kalamazoo Vegetable Parchment Company as chairman and also includes W. J. Alford, Jr., Continental Paper Company; R. J. Cullen, International Paper Company; H. A. Legge, Howard Paper Company; C. B. Morgan, Rayonier, Inc.; F. J. Sensenbrenner, Kimberly-Clark Company; and George R. Wallace, Fitchburg Paper Company. J. L. Riegel, Riegel Paper Corporation, is ex-officio member as president of the American Paper and Pulp Association.

The role of the paper industry is being studied from four basic viewpoints; the effects of the Selective Service Act on the industry is general, its specific effects on the paper industry, the extent to which conscription will take men from the industry, and employee training programs.

▶▶▶ WHEN THE CASE OF THE pulpwood operators, accused of violating the wage and hour law through the payment of unduly low wages by pulpwood contracts, was called for trial in the United States Federal Court on October 16, the government requested postponement. The charges involve an alleged violation of the Fair Labor Standards Act because the defendants, important paper mills, had bought wood from operators who were not paying the amount of wages held to be proper by the government.

▶▶▶ THE CASE IN WHICH the Federal Trade Commission accuses the book paper manufacturers of violation of the Sherman Anti-Trust Act, has been before the authorities in Washington during October, testimony being taken to round out the evidence secured by agents of the Commission in various parts of the country.

▶▶▶ MINIMUM WAGE RATES of 40 cents, 38 cents and 36 cents an hour for the manufacture of various articles from paper have been recommended by the converted paper products industry committee, Chairman Wayne Morse reported to Colonel Philip B. Fleming, wage and hour administrator, recently. The hourly rate of about 25,000 men and women employed in 2,120 establishments located in every major industrial center will be raised if these rates are finally approved.

▶▶▶ UNITED STATES CHEMISTS were assured by the National Bureau of Standards that interruption in the supply of high-grade analytical filter paper, heretofore imported from Europe, is unlikely. According to information received much foreign paper is being received and the United States is now manufacturing it to some extent.

▶▶▶ BLANKETS MADE FROM papermaking felts are needed by England, according to a report from George C. Smith, general supply officer for the American Red Cross, National Headquarters, Washington, D. C. Papermakers desiring to contribute blankets should make sure they are thoroughly scoured before shipping, cut to reasonable size (84 inches in length), properly baled for export, and delivered f.a.s. Port of New York. Those desiring to so co-operate should first communicate with Mr. Smith.

▶▶▶ COMMENDATION FROM SECRETARY OF WAR STIMSON to the Thilmany Pulp and Paper Company, Kaukauna, Wisconsin, was revealed recently. Mr. Stimson praised the paper company because of the company's announced policy, which states that the employees of the concern who are called or compelled to serve in the army or navy in time of peace or war will be reinstated when they return. The Thilmany company has also agreed to pay the premiums for the group life insurance now carried by the employees for men serving the government for one year. The only stipulation is that the man who is called must have served at least a year with the company and he must pass a physical examination when he returns.

◆

FINANCIAL

The Stock Market marked time during October, with activity very low, apparently because of the unwillingness of investors to risk operations until the election is over, or at least until the election trend became apparent.

A. P. W. Paper Company—Net profits for nine months ending September 30 were $32,187, as against a net profit for the same period in 1939 of $103,567.

Bartgis Brothers Company — Net profit for six months ending June 30 was $44,334, as compared with $44,180 for the same period in 1939.

Brown Company—Net profit for forty weeks ending September 7 was $1,478, 333, as compared with a loss of $1,737,671 for the same period of 1939. Income, however, before depreciation depletion and deferred interest, was $2,868,450, compared with a loss in 1939 of $388,100.

Certain-Teed Products Corporation —Net profit for six months ending June 30 was $168,581, as compared with $1,992 for the same period in 1939.

Container Corporation — Earnings for the quarter ending September 30 were $800,917, as against $253,060 for the same quarter in 1939. Shipments during the first nine months of this year were nearly 40 per cent above those in the same period of 1939.

Continental Diamond Fibre Company—Net income for the first eight months of this year was about $300,000, compared with a loss of about the same amount in 1939.

Crystal Tissue Company—Net for nine months ending September 30 was $110,890, as compared with $64,268 for the same period in 1939.

Robert Gair Company—Nine months ended September 30 showed net profit of $530,625, as compared with $97,330 for the same period in 1939.

Hinde and Dauch Paper Company—Net profit for nine months ending September 30 was $682,018, as compared with $422,305 for the same period in 1939.

Hummel-Rose Fibre Corporation—Net profit for thirty-six weeks to September 7 was $552,951, as compared with $65,413, for the same period in 1939.

Kimberly-Clark Corporation — Net profit for the quarter ending September 30 was $363,179, or 74 cents per common share as against 64 cents for the same quarter in 1939.

MacAndrews and Forbes Company

....for continuous Surface Sizing at top running speeds.

At right is a typical Puseyjones Size Press installation. Listed below are the nineteen Puseyjones Size Press installations in operation and on order:

In operation

Hammermill Paper Co.
Erie, Pa. (3)
Champion Paper & Fibre Co.
Canton, N. C. (2)
Hollingsworth & Whitney Co.
Waterville, Me. (1)
Hollingsworth & Whitney Co.
Mobile, Ala. (2)
Everett Pulp & Paper Co.
Everett, Wash. (2)
Mead Corporation
Kingsport, Tenn. (1)
West Virginia Pulp & Paper Co.
Williamsburg, W. Va. (1)
West Virginia Pulp & Paper Co.
Piedmont, W. Va. (2)
Parker-Young Co.
Lincoln, N. H. (1)

On order

Fraser Company
Madawaska, Me. (3)
Bryant Paper Co.
Kalamazoo, Mich. (1)

NOW you can do the surface sizing on the paper machine without reducing speeds of operation.

The improved Puseyjones Size Press does the surface sizing continuously at top running speeds with no loss in production. Recognized as essential equipment in every mill manufacturing Bond, Ledger, Writing, Mimeograph and similar papers. The majority of installations are Puseyjones on machines ranging from 84" to 184".

Surface sizing with the improved Puseyjones Size Press assures a non-glare surface, easy on the eyes. Increases erasing qualities. Adds stiffness and snap for easy handling. Greatly improves surface to take ruling, printing, writing with pen or typewriter, or carbon copying.

The improved Puseyjones Size Press can be used on new or old machines. Write for full details.

THE SIGN OF TRADE MARK SUPERIOR QUALITY

THE PUSEY AND JONES CORPORATION

Established 1848. Builders of Paper-making Machinery. Wilmington, Del.

—Net profit for the nine months ending September 30 was $628,777, as compared with $599,538 for the same period in 1939.

Sabin Rogers Paper Company—Net profit for the year to June 30 was $135,936, as compared with $49,085 in the preceding year.

St. Regis Paper Company—Several subsidiaries have been dissolved and will be operated as divisions of the company. These dissolutions include St. Regis Kraft Company, Panelyte Corporation, and New Hampshire-Vermont Lumber Company.

Soundview Pulp Company — Net profit for the quarter ending September 30 was $509,438, as against $161,370 in the same quarter of 1939.

S. D. Warren Company—Net income for six months ending June 30 was $199,454, as compared with $139,885 for the same period in 1939.

Dividends announced by paper companies include the following: Container Corporation declared a 75 per cent quarterly dividend, bringing the total for the year to September 30 to $1.50 as against 25 cents in all of 1939. Bartgis Brothers declared a 10 cent dividend on the common stock. Simplex Paper Company declared a dividend of 10 cents per share for the third quarter as against 5 cents declared in the preceding quarter.

New York Stock Exchange—Stocks

	Closing Prices Oct. 25 1940	Sept. 25 1940
A. P. W. Paper Co.	*2⅛–2¼	2–2¼
Celotex	7⅜	7⅜
Same Preferred	61	57
Certain-teed	4⅞	5½
Same Preferred	30	33¼
Champion P. & F. Co.	*22–22½	*22–22⅛
Same Preferred	*101–102	*101–102½
Container Corp.	17⅜	14¼
Cont. Diamond	7	6½
Crown Zellerbach	15⅜	15⅜
Same Preferred	88	*87–88½
Dixie Vortex	*10¼–10½	11½
Same "A"	*35–37	*33–37
Robert Gair	*2¾–2⅞	3
Same Preferred	16	*14½–15¼
Gaylord Container	11⅞	12¼
Same Preferred	*44¼–51	*47–50½
International P.&P. Co.	15⅛	14½
Same Preferred	61½	59
Kimberly-Clark	35¼	*35¾–38
MacAndrews & Forbes	*29⅛–30	*28¾–29
Masonite	29¾	28
Mead Corp.	8⅜	*8⅜–9⅛
Same Preferred	*73–75	*75–79
Paraffine Co.	37	*37½–38
Same Preferred	99½	*97½–100
Rayonier	16¼	17
Same Preferred	*26–28½	*29–30
Scott Paper	41	*42–43
Same 4½% Preferred	113⅛	113½
Same 4% Preferred	*108–110½	*108–109
Sutherland Paper	*22½–23	*24¼–26
Union Bag & Paper	11¾	12¼
United Paperboard	*3⅛–3⅜	*3½–3⅞
U. S. Gypsum	75½	80¼
Same Preferred	*177–180	*174–175

New York Stock Exchange—Bonds

Certain-teed 5½%	86½	81
Champion P. & F. Co., 4¾%	103¼	.....
Inter. P. & P. Co. 5%	103⅞	102¼
Same 6%	102⅛	102⅞

New York Curb Exchange—Stocks

Am. Boxboard	*4⅝–5⅛	
Brown Co. Pfd.	*19–21½	20
Great Northern	*39½–40½	*40–41
Hummel-Ross	*6½–6¾	6⅛
Nat. Container	*11⅜–11½	11½
St. Regis	2¾	3
Taggart	*3¼–3⅜	3⅜
United Wallpaper	1⅞	1¾

*Closing Bid and Asked Prices.

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▶▶▶ ACQUISITION OF ALL outstanding preference shares of Alliance Paper Mills by the Howard Smith Paper Mills was announced recently. The latter firm owned 1,938 shares of Alliance and under a resolution authorizing an exchange with the preferred shareholders of Alliance, acquired the balance of 8,097 shares of the total 10,035 preferred shares outstanding.

BRIEFS

▶▶▶ IN ANTICIPATION OF THE NEED for a new printing of Volume 4 of *The Manufacture of Pulp and Paper*, the editor of that publication wished to be informed promptly of any errors that may have been noticed in the third edition. Readers who have discovered errors are urged to point out same to the editor in chief, J. N. Stephenson, Gardenvale, Quebec. It is asked that writers state the section and page number and give the correction in full.

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▶▶▶ THE FIRST TWELVE MONTHS of the war have served to add new importance to the Canadian newsprint and pulp industry in that it stands second only to Canada's gold mines in providing United States exchange, according to a report issued by the Canadian Forestry Association. The importance of U. S. Funds to Canada has been illustrated month by month in the steady increase of imports from the United States.

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▶▶▶ THE WINDMER PAPER MILLS, Newburgh, New York, have been acquired by the National Gypsum Company, which firm will operate the mill for the manufacture of gypsum wallboard papers.

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▶▶▶ A NEW ADDITION TO the Oswego Falls Corporation, Fulton, New York, is now being planned. The addition, one story high, 100 feet by 136 feet, will be of structural steel with concrete and brick sidewalls. A tunnel will be run under the railroad siding to connect the existing building. A restaurant room is also included. Contract for the construction has been given to the H. K. Ferguson Company, Cleveland, it is reported.

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▶▶▶ SOVIET RUSSIA WOOD PULP MILLS are now turning out 1,370,000 metric tons according to a report from the Department of Commerce. The peace treaty with Finland added 370,000 tons of chemical and 14,000 tons of mechanical pulp to the Russian output while annexation of the Baltic states brought in an additional 161,000 tons of chemical and 25,000 tons of mechanical pulp. Before these additions the Russian wood pulp capacity was estimateed at 375,000 tons for chemical and 425,000 tons for mechanical pulp.

▶▶▶ A NEW SALES OFFICE has been opened in Kalamazoo, Michigan, by Rayonier, Incorporated. The office is located in the American National Bank Building, and Gerell Lagerloef has been engaged to represent the company in the middle western territory. He will have his headquarters in the Kalamazoo office.

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▶▶▶ THE DAM AND POWER HOUSE of the St. Maurice Power Corporation at La Tuque, Quebec, has been completed and the first three generators of 44,500 horsepower each have been synchronized to the transmission system of the Shawinigan Water and Power Company. A large proportion of the output of the plant will be absorbed by the La Tuque kraft pulp mill of the Brown Corporation.

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▶▶▶ BROWN COMPANY has transferred the sales functions and personnel of its Portland (Maine) office to the general sales offices in New York City, thus providing a more centralized location for sales headquarters. The departments now in New York include the pulp sales division, paper sales division, and foreign division. The chemical sales division will move to the Brown Company's Boston office.

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▶▶▶ THE SPRUCE SAWFLY, a continual source of worry to Canadian forestry officials, is not as dangerous as heretofore because of a disease which is eliminating the insect. The disease, say officials of the entomology branch of the Dominion Department of Agriculture, attacks the sawfly in the larva stage and destroys it.

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▶▶▶ TWO GROUPS ARE NOW negotiating for purchase of the properties of the Lake Sulphite Company, it was reported recently. The company's mill at Red Rock, Ontario, has a capacity of 540,000 pounds per day of bleached sulphite pulp, cellulose for rayon and refined sulphite screenings.

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▶▶▶ A SOUVENIR OF WAR received by the parents in Ottawa of a soldier serving overseas indicates that Germany has a substitute for metal made from paper. The souvenir is a section of compressed paper, processed to metal hardness, taken from the motor of a German raider shot down in England.

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▶▶▶ CAPITAL INVESTED IN Canada's pulp and paper mills totals over $595,000,000 according to the Dominion Bureau of Statistics. Quebec leads in number of plants and in capital investments.

▶▶▶ THE ALTON BOXBOARD COMPANY MILL at Carlyle, Illinois, is now in operation and will be for quite some time to come, reports have stated. The original mill started in operation 42 years ago. There is an ample supply of baled straw stacked in the yards and the company has already started to increase the reserve stock.

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▶▶▶ A NEW ADDITION to house a paper machine is to be built by the Sidney Roofing and Paper Company, Ltd., Victoria, B. C. The addition is to cost about $46,000.

▶▶▶ THE PRODUCTION of building paper has been commenced by the Powell River Company. Five grades are being manufactured.

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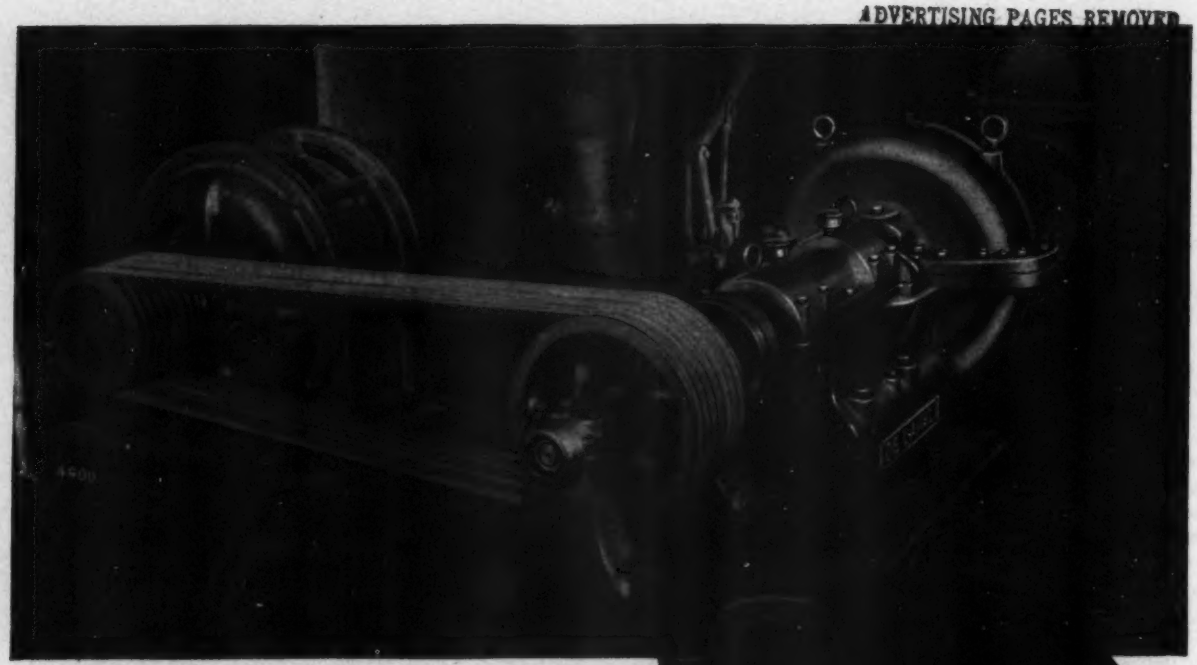
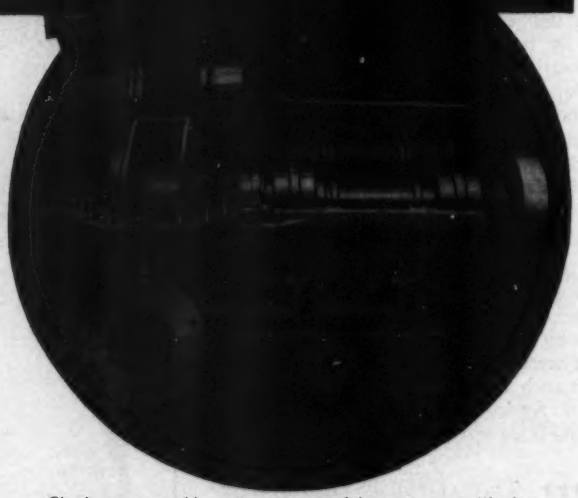
▶▶▶ THE GREEN MOUNTAIN TISSUE COMPANY has taken over the Blake & Higgins paper mill property in Bellows Falls, Vermont, it was reported recently. Frederick W. Vogel of Berlin, New Hampshire, will be co-partner with Allen J. Nadeau of Brookfield, Massachusetts. Mr. Vogel has been associated with a number of paper mills.

The American National Red Cross
Annual Membership Roll Call
November 11-30, 1940

ADVERTISING PAGES REMOVED



PUMPS FOR HANDLING SOLIDS



Clogless pump with casing cover and bearing cover lifted, showing enclosed impeller and accessibility of internal parts.

The principal problems in pumps for liquids carrying solids in suspension, such as paper stock and sewage, are clogging, shaft vibration, and destruction of bearings.

A large suction opening and free passages can be obtained by the use of a single suction impeller, but this type of impeller is overhung, which calls for an extra heavy shaft and ample bearings, spaced well apart. These features have received special attention in the design of the DE LAVAL CLOGLESS PUMP.

The pump herewith illustrated was placed in service in 1932 in the plant of one of the largest and oldest producers of paper board, to transfer stock from primary breaker beaters, in which bundles of waste paper are broken up, to a battery of four grinding beaters, and where much trouble had been experienced with another make of pump.

The De Laval pump has to date had no clogging or mechanical difficulties and has required no replacement of parts, except for one new shaft sleeve.

In all De Laval pumps the shaft, as also the impeller and casing at points exposed to wear, is protected by renewable parts, which are interchangeable and can be inserted by the user, as they do not require to be fitted.

Five other De Laval Clogless Pumps in the same plant have given similarly satisfactory service.

ASK FOR PUBLICATION P-3306

HYDRAULIC INSTITUTE U.S.A. MEMBER

DE LAVAL *Steam Turbine Co.*

TRENTON, N. J.

MANUFACTURERS OF TURBINES · STEAM HYDRAULIC PUMPS · CENTRIFUGAL PROPELLER ROTARY DISPLACEMENT MOTOR MOUNTED MIXED FLOW CLOGLESS SELF PRIMING CENTRIFUGAL BLOWERS and COMPRESSORS GEARS · WORM HELICAL and FLEXIBLE COUPLINGS

EDITORIAL

Election is Over

▸▸▸ EVER SINCE the Republican Convention in Philadelphia, politics has been the uppermost thought in the minds of most people. Wherever two or more people got together, whether casually or for some definite reason, conversation commonly drifted to a discussion of the political situation. Even elevator operators in city office buildings took the stump for their respective candidates and passengers in their cars had to listen whether they wanted to or not.

Just as there is more than one side to every story, there is more than one side to politics. With some citizens, an honest attempt is made to analyze issues at stake and, when conclusions have been drawn, to vote for the candidates they believe best fitted to handle the problems at hand. With others, if thought is given to the issues of the election it is purely of secondary importance. With them, it is always my party, right or wrong. No doubt much could be said in favor of both of these kinds of voters; but probably nothing more important than that they have exercised their franchise to vote—a privilege of every American citizen.

Election is over. The voice of the majority has spoken. The candidates desired by the majority of voters have been elected.

It is now time to forget party differences and to go to work. There is plenty of work to do; and with faith and determination it will be done.

It was on faith that this country was built; and it is upon faith that the United States will continue to go forward—faith in God, in the leaders of our country, in our institutions, in our industries, and in ourselves. Faith gives the confidence so necessary to successful living.

Let Us Remember

▸▸▸ THANKSGIVING DAY will be observed in America this year with a deeper gratitude than has ever before been felt by the American people. With so much of the world torn from the way of peaceful living, our own "land of the free and the home of the brave" means so much that even those of our people who are prone to take our blessings for granted will come to a true realization of all that we enjoy. Traditional good things will be on the table in most of the American homes on Thanksgiving Day, but while we enjoy the bounty of the land, may we not forget to think on that day of those courageous people who are sacrificing all of the pleasures and most of the necessities of life that their freedom may be preserved. May they win that glorious fight, and may those who have been deprived of their freedom—the greatest of all human attributes—look forward to a new day; a day when peace and the joy of living will be theirs once more.

Paper Supply Turns On Duration of War

▸▸▸ FOR MORE THAN A YEAR, we have iterated and reiterated in this column that the trend of the paper business in this country would be governed by the duration of the war.

The reason for that statement lies in the fact that immediately war was declared, Great Britain clamped down an absolute blockade on all exports and imports to Germany. Germany's main outlet to the Atlantic Ocean is through the Baltic Sea, which is also the main outlet for most of the exports from the countries surrounding the Baltic Sea. As the countries in that Baltic area supply approximately one-half of the world's production of wood pulp, naturally, the British blockade became a drastic barrier to the ready shipment to the world's markets of their wood pulp and paper.

As soon as the war became a certainty, the Scandinavian countries, without exception, immediately loaded every vessel procurable, and they were numerous, with pulp and paper consigned to world markets, principally the United States, which are heavy importing countries. Most of these consignments were captured by the Germans and the English and many of them got through the blockade in the initial days before the first of January.

From January through June of 1940, the receipts of pulp in this country were as large as they were for the corresponding months of 1939. Those shipments of pulp coming into this country, added to the pulp supplies on dock and on inventory in the converting mills in the United States, together with the fact that from January to May we witnessed a declining business in the States, all served to give us ample supplies of pulp to come through the first six months' period of this year.

In July, the first drastic shortage in pulp imports occurred. The receipts were 125,000 tons under the imports of 1939. For August, the imports of pulp showed 192,000 tons less than for the corresponding seven months of 1939. So, from July on until the war ends, the imports of pulp from Scandinavia will be negligible. The war will last, at present prospects, another year, perhaps much longer. The struggle is an economic one—that takes time.

Now, during the past ten months, a physical change of momentous import to the pulp industry occurred in the Baltic area. First, Russia invaded Finland, a very active and consistent pulp producer. The end of that struggle found Russia possessing some 500,000 tons or more of prime Finnish pulp production, leaving Finland short of product and in a weakened economic condition. Later on, Germany suddenly invaded Norway and completely dominated that prime pulp producing country. That left Sweden, whose only outlet for export is through the Baltic, with only one market and that is Europe, through the German cartel, which handles and controls all Swedish pulp and paper on German terms.

So, on November 1, the United States sees the war go into its second year and faces the loss of all its imports of Scandinavian pulp, an expanding domestic demand, plus the demand from all other countries and continents, such as India, Africa, South America, Australia, Asia and Japan, all of which formerly took either paper or pulp from the Baltic countries. These countries now look to the United States as their sole source of supply. And our domestic situation is moving toward an acute shortage. There are no foreign sources of supply, and, when the consumer goods demand (as witnessed in 1937) is added to the tremendous volume of durable goods demand which is already pushing for an all-time high record volume in this country, the domestic supply will be wholly inadequate.

CURRENT THOUGHT

NO . . . NO . . . NO!

WILLIAM SIBLEY

▸▸▸ THERE IS PROBABLY ONLY one word in the English language that is easier to say than the word "no." The one word that tops the negative pronouncement in popularity is the word that goes back to the fundamental ego inherent in every man—the word "I." But the word "no" is a close second, and that is probably because it requires no thinking to say "no." "Do you want to buy some insurance?" "No." "Should I do this or that?" "No." "Can I buy a new valve for the heater?" "No." No-no-no-no-no-no. It is *so* easy to say no. One can say "no" without even thinking—and yet remain on the "safe" or at least the uninvolved side.

The fellow who runs against the blinding, baffling "No's," more than the average citizen, is the salesman. Here are a few of the various kinds of "No's" he encounters and a few thoughts on how to overcome them.

1) The ignorant "no." All ignorance rouses fears, and all fears generate negativity; repression, drawing back, conservation. Ignorance is the worst enemy of sales-making, and the presence of ignorance among prospects indicates the presence of poor salesmanship, sluggish sales offensive. The ignorant "no" is best kept away by patiently applying knowledge *before* the "no" is voiced.

2) The challenging "no." This is the signal of the prospect who wants to be "shown" who has his own active ideas, which he may change but which he considers well worked out. He must be met with plenty of good factual material and able argument. Sometimes the challenge is temperamental rather than mental. He may be one who merely likes a good argument. Look out for this sort.

3) The procrastinating "no." There is a temperament which has a habit of postponing action. It does not act until conditions force a move. This is poor management, and it is the part of able salesmanship to show its inadvisability, the costliness of procrastinating inaction.

4) The mistaken "no." People make honest mistakes. They say "no," based on wrong, ill-digested premises. The able salesman must help such a prospect recognize his mistake and help save his face in changing his mind. Beware of personal pride, stubbornness, willfulness, and cultivate the charm which makes it a pleasure to change from no to yes.

5) The impatient "no." Quick temper, hasty, irascible temperament, often produce a premature, impatient "no." Watch it! The salesman often himself induces it by bad tactics, weak or wordy argument. How to unravel, revise an "impatient no" is important in selling. Diplomacy, graciousness, cool temper, clear, concise argument are called for.

6) The indecisive "no." Authentically, there are many people almost incapable of making up their minds or coming to a decision. It is a constitutional weakness. They need the mental and emotional aid of a trustworthy salesman who understands the part he must play, to come to a decision; not only to fortify their logic and their basis of action, but also, most importantly, to give impetus to the closing.

7) The arbitrary "no." The arbitrary temperament may habitually give this "no," or it may arise from crude salesmanship or other cause. It puts the salesman on the spot. He only makes matters worse by further argument. His move is either to come back another time with a fresh approach or to accept the no for the moment, and then look for an edge to reopen from a different angle. Sometimes the prospect actually welcomes this, since he has secretly recognized his own arbitrariness.

ARE YOU IN THE DRAFT?

▸▸▸ IN THIS INDUSTRY there are quite a number of young men on the sunny side of 36. In the first place, that's swell. Some of the rest of us aren't. But some of those who are don't think it's swell, because being on the early side of that age they had to register for the draft. In the words of the old song: "Oh! Dry Those Tears!" Because, mathematically, it is a 20-to-1 shot you won't be drafted.

But what if you *are!* And what if you should be in the army during actual war (which we aren't in as yet, by quite another long-shot). Okay. Remember this: there are more casualties among the 3,000 taxi drivers in Chicago (during any three-year period) than there were among the average 3,000 active soldiers during World War I. In short, it is more dangerous to be a taxi driver on State Street than it is to be a soldier in the U. S. Army during war-time.

But what if you are not drafted? Okay—then you go without training or drill or discipline. You might well be like the writer. He enlisted in the first World War as a buck private. Within five weeks after he landed at Camp Custer (Michigan) he was sent to France—and hadn't yet been given a gun, let alone taught how to use it. He was one of the two million "over there"—and one of the 1,500,000 American soldiers in France who never heard a shot fired or saw a puff of smoke. But he'll tell you one thing—he got a lot of training and experience in the 22 months on the other side that has helped him throughout life. Getting into the Army doesn't mean that you are going to be killed or hurt. The chances are you won't be. Getting into the Army does mean, however, getting a lot of marvelous training and experience—and a swell education in being an American. . . . Thank God for this peace-time draft. Remember: the longer the draft list—the shorter the casualty list.

Storing Bituminous Coal

J. E. TOBEY[1] and C. F. HARDY[2]

▸▸▸ COAL IS STORED in large and in small industrial plants for several reasons. First, to insure plant operation regardless of weather conditions, interruptions of supply, or interruptions of transportation. The second reason is the seasonal fluctuations in coal prices. If industrial coal is bought when the supply exceeds the demand, or when there is a large demand for domestic coal, it may be profitable for industrial plants to store coal for future use. Plants in the lake regions store coal because the lakes are open only in summer, and there is a considerable saving in freight costs on the water borne coal.

The amount of coal to be stored to prevent shutdown depends largely on the experience the plant has had with supply and transportation. Savings in operating costs that would be possible because coal could be bought at an extremely low price, would also have some bearing on the amount of coal to be stored.

When coal is stored to take advantage of low prices, distress coal, or to hedge against price advances, the problems become largely economic. The cost of unloading the coal on the ground, reclaiming the stored coal, and the loss in heating value through weathering, spontaneous heating, breakage, etc., must be given careful consideration.

The greatest bugaboo of storing coal is the danger of spontaneous combustion. Anyone who has ever tried to put out a fire in a burning coal pile, knows that this is one of the most perplexing problems in power plant operation. The loss occasioned by spontaneous combustion in coal piles must reach staggering totals each year in this country.

Surprisingly little material has ever reached the literature concerning the storage of coal, spontaneous combustion of coal, and its prevention. Probably the first reference to a coal mine fire in this country was by Lewis Evans (*1*) who refers to a fire in a coal mine which burned for over a year in 1748-49.

In 1818, reference was made to a coal bank being on fire at Pittsburgh, but no mention made of how it became ignited. Apparently considerable difficulty was experienced in extinguishing this fire as it was described in 1820 as being like a volcano.

The authors are associated with Appalachian Coals, Incorporated. (1) Vice president in charge of engineering; (2) fuel engineer.

Rules for Storing Coal

The size of coal stored depends on what size the individual plant requires, and any size may be stored safely.

In brief, the rules for storing coal are:

1) If the storage is on the ground, the surface should be smooth and free from cinders, ashes, coke, etc. Coke and cinders have been blamed for helping spontaneous combustion, and it may be possible that they do. A little preparation will help tremendously in recovering the coal and will reduce the danger of spontaneous heating.

2) Surface drainage should be away from the coal pile and care should be taken that oil, cutting compounds, and other plant wastes should not be allowed to drain toward the coal. The coal should not be piled over any lines which may be hot. Underground steam lines, sewers carrying hot water, as from the boiler blow-downs, etc., should be avoided, if at all possible.

It might be better to break the pile and not place coal over such a source of heat even though it seems very slight. As noted before, only a few degrees, perhaps fifty, above summer temperature are necessary to cause serious heating. This particularly is true of bituminous B and lower rank coals.

3) Coal should be piled in layers rather than in a conical pile. The conveyor discharge, spout, or whatever means of piling is used should be moved if possible so that the coal is distributed over the area to be covered as it is unloaded. When a clamshell bucket is used, or a bulldozer is available, this process is very simple. A scoop or similar device used with an industrial tractor also may be used. This will help prevent heating and also will prevent segregation. The coal will be much more uniform in mixture when removed.

4) Compacting the pile seems to prevent heating and should be done in case of large piles, particularly.

There is no exact data, as far as we have been able to determine on how large or how deep a pile may be before compacting is necessary.

The length of time the coal is to be in storage also has a great bearing on this as well as other factors in storage.

5) Height of the pile is also largely indeterminate. A maximum height of 20 feet has been a rule in several plants, and has been satisfactory for them. We believe that compacting should be used if it is necessary to go above this height.

6) Pipes which may be used for temperature measurement should be inserted in large piles and the temperatures checked weekly. These pipes may be discarded piping, boiler tubes, or anything that is available. The size is not important. The authors have used pipes on 25 ft. centers, although it might be advisable to make them closer if storing low grade coal.

7) Sealing should be done on large piles or on piles of lower grade coals which are likely to be in storage for a long period. An increasing number of mines in all mining districts now air clean coal, and it is probable that –30, –40, or –48 mesh coal can be obtained from the regular source of supply for this purpose. Large piles which are not sealed when built should have the slopes trimmed so that sealing with fine coal will be a comparatively simple operation.

If these few simple rules are put into practice, then the plant may expect little trouble from the storing of coal, and reap the advantages of continuous operation and hedge against price advances.

Resistance of Various Coals to Air Flow*

	Velocity (ft. per sec.)		
	0.01	0.1	1.0
Pocahontas Screenings		.035	.40
Pocahontas, crushed		.01	.13
Kentucky Screenings, loose, wet		.04	.50
Kentucky Screenings, loose, dry		.05	.9
Kentucky Screenings, moderately packed, wet		.12	1.6
Kentucky Screenings, hard packed, wet		.15	2.1
Kentucky Screenings, hard packed, dry		.17	3.4
5/16-in. Illinois carbon		.24	4.2
Illinois, minus 48-mesh, loose	.7	6.0	45.
Illinois, minus 48-mesh, 100 lb. per sq. ft. loading	.9	7.5	
Illinois, minus 48-mesh, 150 lb. per sq. ft. loading	1.1	9.0	
Wet Illinois, minus 48-mesh, packed	practically air tight		

(*) Pressure Loss (inches of water) per foot of coal for various air velocities.

In 1865, Varrentrapp (*2*) found that freshly mined coal oxidized rapidly. This was followed by a temperature rise inside the heap and this temperature sometimes reached the ignition point of the coal, thereby causing combustion. One early investigator found a loss of heating value of 7 per cent in six months and attributed it to fermentation, or "wet rot." The idea of fermentation of coal was rather popular with other early investigators, although there is no record of anyone trying to make use of the supposed resulting compounds.

The *Gas World* (*3*) published two articles in 1901 regarding spontaneous combustion, both of which gave some importance to sulphur in coal in the form of pyrites. Another investigator in the same period thought that the different sulphides of iron in coal might react differently. This is interesting in light of our present day investigations of the reactivity of the different constituents of ash.

The danger of spontaneous combustion on shipboard was considered at great length by several board (*4*) and committees, mainly from the standpoint of whether wet coal was more likely to heat than dry coal, and whether the holds or bunkers should be ventilated or sealed tightly. Some of the proponents of ventilated storage were afraid of marsh gas (methane) coming off the coal and seeping out of the bunkers into other parts of the ship. Several explosions were attributed to this cause. Parr and Baker (*5*) tested some Illinois coals and found that marsh gas was exuded from freshly mined coal for a period of two months or more; R. T. Chamberlin of the U. S. Geological Survey (*6*) tested some West Virginia and Pennsylvania coals and found that gas in the form of methane was released from them. Just what part this gas plays in spontaneous combustion has never been settled, but it is possible that it has some bearing, although the relatively high ignition temperature of methane (1260-1380 deg. Fahr.) would seem to eliminate it, as one of the primary causes of spontaneous combustion.

Parr and Kressman made a complete study of the spontaneous heating of coal, including a summary of most of the previous work. Their results were published in 1910 in Bulletin No. 46, University of Illinois. Briefly their conclusions were:

1) Oxidation of coal begins with freshly mined coal and continues over a wide range of time and conditions. A number of processes are involved, some slow and some rapid.

2) There is a critical temperature, generally speaking, above which oxidation is destructive and self-supporting and does not depend on external conditions to help it. Below this temperature, the oxidation is harmless and even if the temperature approaches the critical point, due to external aids it will drop when these conditions change.

3) The point where oxidation becomes self-supporting, varies for different conditions, but is approximately 392 deg. Fahr. to 482 deg. Fahr. in air. It is lower in oxygen. Actual ignition, or kindling is usually reached above 660 deg. Fahr.

4) The temperature at which self-supporting oxidation begins is the sum of numerous temperature components, each of which may add heat or increase the activity of the reactions to the ultimate result of combustion.

The factors most important are listed as:

a) External source of heat, such as steam pipes, smoke stacks, etc.; Heat of impact or pressure generated in piping; Seasonal temperatures; Absorption of heat from the sun.

b) Size consist, or fineness of division.

c) Easily oxidizable compounds or unsaturated chemical compounds which pick up oxygen very rapidly.

d) Iron pyrites which oxidize rapidly in fine sizes are a definite source of heat which contribute to spontaneous combustion.

e) Moisture, which not only reacts with the pyrites, but also increases activity of the coal as a whole.

f) Oxidation of carbon and hydrogen. This oxidation results when the temperature of the pile is increased by some other means, but is dangerous because of the large amount of heat released. It in turn promotes the last stage of oxidation which starts at around 400 deg. Fahr. and is self-supporting, rapidly resulting in kindling or ignition temperatures.

Katz and Porter in studying the effect of moisture on stored coal, described in Tech. Paper No. 172 U. S. Bureau of Mines, decided that wet fine coal would stop the circulation of air in a coal pile, thus preventing the dispersal of heat from where it formed. This was on the right track, but later investigations showed that air should not circulate in coal piles. They recommended that segregation in storage be prevented as much as possible.

In a study of the ignition temperature of coal, Arms (*7*) found that when coal is gently heated, it begins to autogenously give off heat at about 250 deg. Fahr.; and that the glow point where ignition would presumably take place ranges from 811 deg. Fahr. up to 1035 deg. Fahr. for different kinds of coal. He found that although the glow point was the same, coal that was wet heated at a lower temperature than similar coal that was dry, and that a high ash coal heated at a lower temperature than a low ash coal. The pyrites in high sulphur coal begin to glow much sooner than the coal substance proper which was expected as their ignition temperature is known to be lower.

Porter (*8*) states "In the case of a solid, ignition is assured when the rate of heat production by oxidation of a given surface area begins to exceed the rate of heat loss to the surroundings. The ensuing autogenous temperature rise then brings the material to the glow or flame point (ignition) at a rate dependent on its coefficient of oxidation acceleration with temperature; its exposed surface per unit of weight and the rate of oxygen supply or air renewal on the surface."

He also found that "in general, the ignitibility increased with the increase of oxygen in the dry-ash-free material (that is, with decreasing rank) but the differences are small within the group of Class A bituminous and semi-bituminous coals." He found that coals range in ignitibility roughly as to their humic or lignin plus cellulose content.

A partial decomposition and charring according to the same authority, increases the ignitibility. Thus, low temperature coke has a slightly lower ignition point than the parent coal. He

also confirmed the statement made by earlier investigators that bituminous coal ignites at a lower temperature than any flammable gas distilled from it.

Drewey (9) proved beyond a reasonable doubt that the infiltration of air into a coal pile causes heating. He describes an almost perfect setup for spontaneous combustion: freshly mined bituminous B coal, high in oxygen and sulphur, run-of-mine size—including all the dust, in a pile 50 ft. high, exposed to high winds. The only factor lacking was some external source of heat (other than the sun). The coal had been carefully unloaded and packed to the extent of 18 per cent greater density. Undoubtedly, this run-of-mine coal could not be as well packed as slack coal could have been. The pile heated to 120 deg. Fahr. or more in two months so asphalt was applied to the top, presumably to stop chimney action through the coal. This proved unsuccessful and the temperature at one point went up to 800 deg. Fahr. The sides of the pile were then asphalted, sealing out air completely, and the temperature went down to a constant of around 165 deg. Fahr. Later, Drewey relates that a 12-inch layer of –48-mesh coal was used in place of the asphalt as a sealing agent on other coal piles, with a dressing of nut slack over the pile to reduce windage losses. This cost less and worked just as well.

It is interesting to note that the loss of heating value during the three years' storage in the pile that was sealed with asphalt, was 4.15 per cent.

The authors in some rather unscientific experiments concluded that unsealed 2-in. N.S. lost about 6 per cent of the heating value in three years, and very little thereafter. If these values are correct, the covering of piles could be justified as a heat loss preventive as well as for fire prevention. Below is reproduced a table (9) which shows the resistance of various coals to air flow. It is surprising how little resistance even 5/16-in. carbon offers to air flow.

Several companies have been successful with building piles in layers. Usually the coal is put on the piles in layers from one foot to four feet thick, each layer being compacted by means of bulldozer, road roller, or caterpillar crane. This tends to prevent segregation and is valuable from two angles: (1) it assures a fairly uniform size consist when the coal is recovered for use in the plant; (2) conical piling where coal is dropped from the same point to the total height of the pile, makes "Chimneys" of coarse coal where two such piles come together, as the coarsest coal always rolls to the outside of a conical pile. Layer piling tends to prevent the formation of these "chimneys."

In the light of this table it may be futile to expect to completely stop air currents in the pile by compacting the coal. The additional resistance may be sufficient to prevent enough air penetrating the pile to cause trouble. This is true, we believe, of the higher rank (semi-bituminous and bituminous A) coals with comparatively low sulphur content. Compacting the slack sizes seems to work in most cases, even in fairly high piles.

It may be said that:

a) Loss from oxidation, if the coal is stored properly, is very small and can be neglected in most cases.

b) In general, the better the grade or the higher the rank of coal, the less danger of spontaneous heating.

c) The sulphur content, or the pyrite content of the coal usually indicates the amount of trouble necessary to store it safely. The higher the sulphur, the more chance of self-ignition in general. This is also true to a certain extent of ash, although it is not a hard and fast rule.

d) Surface moisture helps the air circulation and possibly aids ignition. Inherent moisture apparently helps to oxidize the pyrites and perhaps helps in other oxidation.

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SPLICING CONVEYOR BELTS

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▶▶▶ PRACTICALLY ALL CONVEYOR BELTS can be joined successfully by means of metal fasteners. There are several good conveyor belt fasteners on the market.

For light and medium duty conveyors the "staple" type of fastener gives very good results. This type is very easily applied and requires no special tools.

For heavy duty, high tension conveyors the double plate type of fastener should be used. The plates serve to compress the belt and the anchorage is thereby materially increased. This type of fastener should be used wherever there is a severe reverse bend, due to tandem or tripper pulleys. The shallow plates become embedded in the covers and the center pull is along the neutral axis of the belt.

Care should be used in cutting the ends of the belt square. If belt holes are required these should be carefully punched so the fasteners will pull uniformly over the width of the various plies. Uneven strains due to improperly applied fasteners may result in ply separation or belt injury. The fasteners should be inspected regularly and renewed at the first indication of weakness.

If the conveyor handles corrosive material which would deteriorate the cotton fabric, the cut ends of the belt and the belt holes should be coated with rubber cement and special corrosion resisting fasteners should be used.

If corrosive conditions are excessive, and conditions permit, the belt should be made endless in the factory or through use of a field vulcanizer.

A number of large operators of conveyors have experienced economy in making belts endless with these portable electric vulcanizers. The vulcanized splices are stronger and have the advantage of giving smoother traction when traveling over the pulleys.

Since most installations require occasional repairs and resplicing during the life of the belt, the possession of a vulcanizer and a crew trained to make splices is desirable.

Before making a long center conveyor belt endless in the field it is usually good practice to first operate the belt temporarily with fasteners. This procedure reduces the likelihood of the belt stretching beyond the limits of the take-up and necessitating a new splice.

Important Properties of
Electrical Insulating Papers

H. H. RACE[1], R. J. HEMPHILL[2] and H. S. ENDICOTT[1]

▶▶▶ LOW COST, GOOD ELECTRICAL and mechanical properties, and the availability and controllability of wide ranges of physical characteristics are the major reasons for the many uses of paper in the electrical industry. An idea of its importance may be gained from the fact that one manufacturing company alone will purchase approximately $2,000,000 worth of insulating papers during the present year. The quality of insulating paper is extremely important because improvements in quality result in corresponding decreases in the quantity required for a given application. Furthermore, in many types of apparatus, savings in space occupied by insulating paper make possible further savings in size, weight, and cost. For example, in a typical piece of electrical apparatus, although the cost of the insulation and its fabrication represents only 13 per cent of the total cost, a decrease of 10 per cent of the required volume of the insulation may result in a smaller unit of the same rating with a disproportionately larger saving in total cost. The possibility of such a saving provides one of the incentives for continued attempts at quality improvement of insulating paper.

The object of this article is to present information about the types of paper commonly used in electrical apparatus, to indicate the testing methods used to evaluate and to control their quality, and to give typical data concerning some of the electrical properties which are not so familiar to paper manufacturers. Furthermore, it is extremely important to point out that the desired electrical properties are directly dependent upon the physical and chemical properties incorporated in the paper by the maker.

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TYPES OF PAPER AND THEIR PROPERTIES

The table shown on this page lists a number of types of paper commonly used in the electrical industry. Where available, the more important physical, chemical and electrical properties of the several types are given.

RANGES OF PROPERTIES OF INSULATING

	Raw Material	Type Mach.	Thickness (Inches)	Apparent Density (gm./cc.)	Finish	Tensile Strength (lb./sq. in.) x10⁻³		Tearing Strength (gms./mil thick)	
						MD	CMD	MD	CMD
1. Dielectric Capacitor Paper	100% Kraft	F	0.0003-0.001	0.90-1.1	SC	.....	.....	.....	.....
	100% Linen	F	0.0003-0.001	0.9-1.1	SC	.....	.....	.....	.....
2. Electrolytic Capacitor Paper	Misc.	F	0.001-0.003	0.45-0.55	MC	.....	.....	.....	.....
3. Cable Paper	100% Kraft	C&F	0.003-0.010	0.7-1.1	MC & SC	8-16	4-6	20-40	40-60
	Manila	C&F	0.001-0.010	0.7-0.75	MC	10-16	3-5	35-70	45-70
4. Coil Winding Paper	Misc.	F	0.0007-0.005	0.8-1.1	MC	.....	.....	.....	.....
5. Saturating Papers	100% Kraft	F	0.0015-0.035	0.5-0.9	MC	4-8	2-3	.....	.....
	Alpha	F	0.003-0.015	0.5-0.9	MC	0.2-1†	0.1-0.5	.....	.....
6. Layer Insulation	100% Kraft	C	0.005-0.030	0.7-1.0	MC-SC-WF	8-16	5-7	35-50	40-55
	100% Kraft	F	0.001-0.015	0.8-.85	MC-SC-WF	6-10	4-5	10-15	10-15
7. Pressboards	100% Rag	W	0.005-0.025	≧1.2	GR	11-12	4-5	40-60	60-90
	75% Rag, 25% Kraft	W	0.030-0.125	1-1.2	SC	.....	.....	.....	.....
	100% Kraft	W	0.030-0.125	1-1.2	SC	10-12	4-5	.....	.....

(*) Sec./mil/100 cc. (**) Gurley Densometer (400 cc.). (†) Meas. after soaking in varnish. KEY TO ABBREVIATIONS: F—fourdrinier machine; C—cylinder machine; W—wet machine; MC—machine calendered; SC—supercalendered; WF—water finished; GR—glaze

A. RAW MATERIALS AND PAPER-MAKING MACHINES

1. Raw Materials. The great bulk of insulating paper is made from kraft pulp, linen rags, cotton rags, and manila hemp. Methods are available for identification of fibers (*1*) showing differences in the structure of fibers derived from these several sources. Each of these materials has properties which make it especially desirable for specific applications, some of which will be shown later.

2. Types of Paper-Making Machines. Because of the wide differences in the physical properties required in electrical insulating papers, they are made on the three common types of paper-making machines (*2*) and their modifications. In the table, these are designated as (F) fourdrinier, (C) cylinder, and (W) wet machines.

B. TEST METHODS AND THEIR SIGNIFICANCE

Physical Properties

1. Thickness. Under this heading are given common ranges in which paper is made for different applications. The thicknesses given are nominal values measured by means of a machinist micrometer, ASTM D374 method A, or dial gauge according to TAPPI method T411. Normally ± 10 per cent tolerance in thickness is allowable.

2. Apparent Density. ASTM D202-39T. Experience has shown that the electrical properties; i.e., dielectric strength, dielectric loss, and dielectric constant depend upon the apparent density so that this property must be closely controlled about the value found most desirable for a specific application. In the table are given nominal density ranges.

3. Finish. The finishing operation is very important in determining the physical properties such as density, smoothness, and mechanical strength. The common finishes are machine calendered (MC), supercalendered (SC), water finished (WF), and glaze rolled (GR).

4. Tensile Strength. ASTM D202-39T and TAPPI T404. This is normally measured both in the direction of formation of the sheet (MD) and at right angles to it (CMD). It is of particular importance in papers applied in the form of tape where tension is used to obtain a tight structure.

5. Tearing Strength. ASTM D202-39T and TAPPI T414. One of the important uses for insulating papers is spiral wrapping in tape form on electrical conductors. In such operations the paper is subjected to crosswise tearing stresses as well as simple tension.

6. Porosity (Air Resistance). The method in general use for indicating the porosity of paper is to measure the rate of flow of air through the sheet under a specified pressure difference. (ASTM D202-39T and GE method E1B8). The latter method has been developed for testing low porosity paper. Porosity is an indication of the structure of the sheet and is of importance in determining the suitability of the paper for use where impregnation with oils, resins, varnishes, etc., is involved.

Chemical Properties

7. Ash Content. TAPPI 413. A low ash content is an indication of freedom from clay, fillers, pigments and other inorganic contaminants, the presence of which might lead to poor electrical properties.

8. Acidity. ASTM D202-39T and TAPPI T413. From the standpoint of chemical and electrical stability over a period of years during operation at elevated temperatures, neutral papers have proved most satisfactory. The present

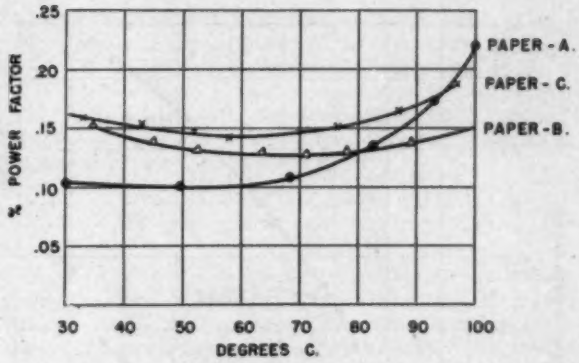

Fig. 1—Dry capacitor paper. Power factor vs. temperature.

PAPERS

Porosity (air resist. sec.)	Ash Cont. (per cent)	Chlorides	Sulphates	Conducting Particles No./sq.ft.	Conducting Particles V/mil	60 deg. C. 60 Cy. PF (Dry)
≧250	<0.5	NDA	NDA	≦10	110	≦0.002
≧250	<0.5	NDA	NDA	≦10	110	≦0.002
<1	<0.3	NDA	NDA	≦5	110	.....
8-500*	0.3-0.4	NDA	NDA	.....	....	≦0.002
3-20*	2.5	NDA	NDA	.....	....	.....
.....	≦0.5	NDA	NDA	.....	....	.....
5-20**	1	.....	.....	.....	....	.....
5-50**	1	.....	.....	.....	....	.....
.....	≦1	.....	.....	<0.07	100	.....
.....	≦1	.....	.....	<0.07	100	.....
.....	≦1	.....	.....	≦0.01	150	.....
.....	≦4	.....	.....	≦0.01	100	.....
.....	≦1	.....	.....	≦0.01	100	.....

rolled; MD—measurement of tensile strength in direction of formation of sheet; CMD—measurement of tensile strength at right angles to direction of formation of sheet. NDA—no detectable amount.

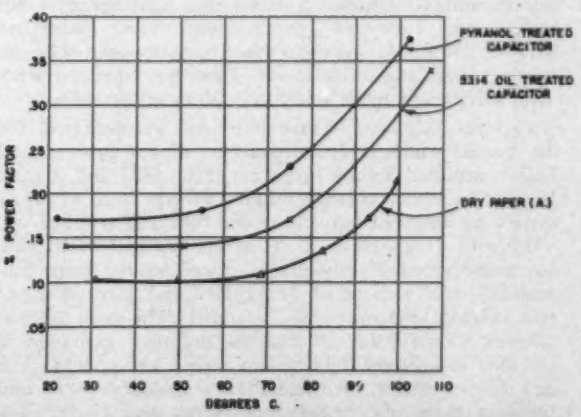

Fig. 2—Comparison between the power factor vs. temperature curves of dry paper and those of the impregnated paper.

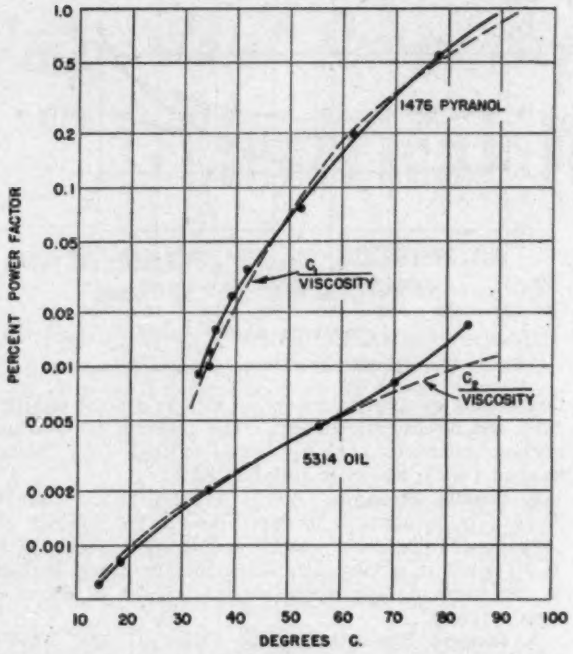

Fig. 3—Power factor vs. temperature and reciprocal viscosity vs. temperature curves for GE No. 5314 oil and GE No. 1476 Pyranol.

methods for measuring this property are not altogether satisfactory and a new method, proposed by Laurner (*3*), is being investigated by ASTM and TAPPI.

9 and 10. Chlorides and Sulphates. From the standpoint of electrical properties it is necessary to keep electrolytic contamination to a minimum. A special control method for establishing an upper limit for such contamination has been developed, important details of which are as follows: A 10 gm., cut sample of paper, is boiled for 15 minutes in 250 cc. of distilled water.

Test for Chlorides. Three test tubes are prepared, into the first of which is decanted 10 cc. of the *hot* extract. This is acidified with two drops of concentrated HNO_3 and 2 cc. of 10 per cent solution of silver nitrate added. 10 cc. of the *hot* extract are decanted into the second tube and acidified with 2 drops of concentrated HNO_3. 10 cc. of hot distilled water which has been boiled 15 minutes is placed in the third tube, acidified with 2 drops of concentrated HNO_3 and 2 cc. of 10 per cent solution of silver nitrate added. The three tubes are allowed to stand in the dark for 30 minutes and then examined for turbidity in a strong light against a dark background. Tube #1 (paper extract, silver nitrate and nitric acid) should show no more turbidity than tube #2 (paper extract and nitric acid). Tube #3 (distilled water, silver nitrate and nitric acid) must show no turbidity.

Test for Sulphates. Three test tubes are prepared, into the first of which is decanted 10 cc. of *hot* paper extract. This is acidified with 3 drops of (1:1) HCl and 2 cc. of 10 per cent barium chloride solution added. 10 cc. of the *hot* extract are decanted into the second tube and acidified with 3 drops of (1:1) HCl. 10 cc. of hot distilled water which has been boiled 15 minutes is placed in the third tube, acidified with 3 drops of (1:1) HCl and 2 cc. of 10 per cent solution of barium chloride added. The three tubes are allowed to stand for 30 minutes and then examined for turbidity in a strong light against a dark background. Tube #1 (paper extract, HCl and $BaCl_2$) should show no more turbidity than tube #2 (paper extract and HCl). Tube #3 (distilled water HCl and $BaCl_2$) must show no turbidity.

It is estimated roughly that NDA (no detectible amount) corresponds to approximately 60 ppm of chlorides or sulphates in the dry paper.

11. Conducting Particles. (Survey for Conducting Paths)—ASTM D202-39T. It is common practice for users of sheet insulation to control quality by measuring the number of conducting particles or spots of low dielectric strength. The method usually employed for layer insulation is to pass the sheet between a metal plate and set of rollers. Voltage is applied between the rollers and the plate and, as the paper is drawn through, an operator marks the spots at which failures occur. The spots are subsequently cut out. In the case of thin papers for use in capacitors or cables, samples only are tested. Single sheets are laid on a metal plate and a metal roller is run over them by hand. Headphones are connected in series with the voltage supply and the electrodes, and the operator counts the clicks as the conducting spots are found. A device for testing continuous lengths of thin paper is pictured by J. M. Finch (*4*). In the table are given the maximum tolerable number per unit area and the gradient at which the test is made. Considerable effort, over a period of years, has been expended to get the number of conducting particles as low as indicated. Nevertheless, it would be a real advantage to the electrical industry if their number could be still further reduced.

Electrical Properties

12. Power Factor—Dry. This test is applied wherever the dielectric losses of the finished part are of primary importance. It is probably the most rigid test made on capacitor paper, and, since it is relatively new, details and typical data are included in the next section.

C. TYPES OF PAPER AND THEIR PARTICULAR REQUIREMENTS

1. Dielectric Capacitor Paper. In capacitors, very thin dielectrics are required in order to obtain high capacitance per unit area. Furthermore, to prevent electrical failure resulting from a single conducting particle or weak spot in one sheet, it is necessary to use two or more sheets in series. In this way the probability of failure from such imperfections is greatly reduced. Thus, instead of using a single sheet of 0.0009-inch paper, three sheets of 0.0003-inch paper are commonly used. For such use papers were originally made from linen fiber but are now made largely from all kraft pulp. Small amounts are made, particularly in European countries, from sulphite pulp, but the use of the latter has been very much restricted due to the instability of the electrical and physical characteristics.

Capacitor papers are manufactured from well-washed and well-beaten pulp. The beating cycle in some cases may be as long as 48 hours in order to bring about the high degree of hydration and fibrillation necessary for the fabrication of a thin, well-formed sheet.

The paper is made on a fourdrinier machine, sometimes with an Edwards' attachment, but in greater amounts on a fourdrinier machine of the Harper type. Some kind of centrifugal separator is always used on the stock before it goes to the machine to remove metallic and other conducting

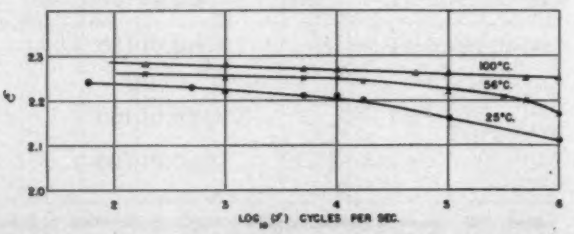

Fig. 4—Dry cable paper. Dielectric constant (E') as a function of frequency.

Fig. 5—Dry cable paper. Dielectric loss factor (E″) as a function of frequency.

particles of high density. The sheet is supercalendered to produce a high finish, improve the uniformity of thickness, and increase the density.

These papers are characterized by good formation, high air resistance, relative freedom from metallic and conducting particles, freedom from other impurities, and uniformity of thickness.

One of the most important properties of this type of paper is its dielectric loss because losses represent energy wasted as heat, and heat-dissipating ability is one of the limitations of electrical apparatus. As shown in the Appendix (Eq. 7a), the heat generated per unit volume (for low loss materials) is proportional to the square of the voltage gradient, $(E/l)^2$, the dielectric constant, E′ *(Throughout this article,* E′ *and* E″ *represent epsilon* (ε) *prime and double prime.),* and the power factor, (PF). Since economic considerations demand a high voltage gradient and a high dielectric constant, power factor is the only term which is subject to reduction.

The power factor of a composite dielectric consisting of impregnating liquid and paper is a function of the power factors and the dielectric constants of the two components, but, in general, it is not possible to calculate exactly the power factor of such a combination from measurements on the separate components. However, power factor measurements on paper alone have been used for years to detect and rejects lots of paper which showed high losses. Recently such methods have been considerably refined and a direct correlation has been found between the 60-cycle per second P.F. as a function of temperature of the paper alone and of the finished capacitor.

Flat disc guarded electrodes have been used with the paper under a stress of 125 V.P.M. In making such measurements it is essential that the paper be thoroughly dried and maintained in that condition throughout the test. To insure this, the electrodes, with the paper in place, were mounted in a desiccator and dried for 16 hours at 100 deg. C. under a pressure of 10^{-3} mm. At the end of the drying period, thoroughly dried air was admitted and the electrical measurements made at intervals as the temperature dropped.

Figure 1 shows typical curves for capacitor papers. These curves demonstrate the fact that it is possible to change the value of the power factor as well as the shape of the power factor/temperature curve of paper sheets by changing the nature of the pulp.

Figure 2 gives a comparison between the power factor/temperature curves of dry paper (A) and those of the oil or Pyranol impregnated paper.

It is possible to explain these data if the paper and impregnant are assumed to form a two-layer series dielectric (*5*).

For this condition the following relations apply:*

$$E' = \frac{E'_t E_1}{\theta_t E_1 + \theta_1 E'_t} \qquad (1)$$

(*) For definitions of electrical quantities see Appendix.

Where E′ = dielectric constant of the combination
E'_t = dielectric constant of the paper fibers
E_1 = dielectric constant of the impregnant
θ_t = fractional volume represented by paper fibers
θ_1 = fractional volume represented by impregnant

In low-loss materials, for which the cosine and cotangent of the loss angle are approximately equal

$$PF = \frac{\theta_t E'_1 (PF_t) + \theta_1 E'_t (PF_1)}{\theta_t E_1 + \theta_1 E'_t} \qquad (2)$$

Figure 3 shows the power factor/temperature relation for a low viscosity cable oil (GE #5314) and GE #1476 Pyranol. At 60 cycles per second over the temperature range shown, the power factor is due to conduction. The change in conductivity with temperature results from changes in viscosity as indicated by the reciprocal viscosity-temperature curves shown dashed in Figure 3. It is evident that the power factor of the liquid as given in Figure 3 combined with the power factor of the paper in Figure 1 will not give the curves of Figure 2 for the impregnated capacitor.

It seems reasonable to assume, therefore, that the paper fibers of the dense, high air resistant sheets used for capacitors prevent most of the ionic conduction. The conductance of the liquid, unless of a much higher order of magnitude, will thus contribute nothing to the power factor of the impregnated capacitor.

By taking the ratio between Equation 1 when $E'_1 = 1$ (air) and when $E'_1 = E'_0$ (liquid impregnant) the increase in capacity due to impregnation can be calculated. Similarly, from Equation 2 (assuming that $PF_1 = 0$ on the basis of the preceding paragraph) we can calculate the increase in power factor due to impregnation.

On this basis the two ratios are identical and are

$$\text{ratio}\frac{\text{impregnated}}{\text{unimpregnated}} = E'_1 \frac{\theta_t + \theta_1 E'_t}{\theta_t E'_1 + \theta_1 E'_t} \qquad (3)$$

It can be shown by the use of the above equations that the increase of power factor of impregnated specimens over dry paper alone can be accounted for by the change in the capacitance of the specimen with the assumption that the losses in the impregnant are negligible.

We are thus led to the conclusions that:

(a) *the dielectric losses depend upon the dielectric loss in the paper and the relative dielectric constants of liquid and paper and not on the power factor of the liquid,* and

(b) *the greatest possibility for a reduction in dielectric loss over the usual temperature and frequency range lies in improving the electrical properties of the paper.*

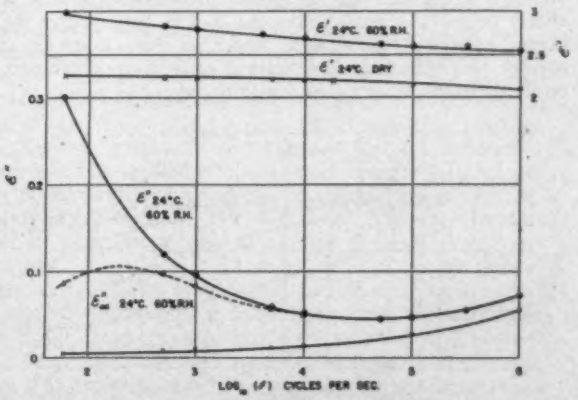

Fig. 6—Cable paper. Dielectric constant (E′) and dielectric loss factor (E″) dry and after reaching equilibrium at 60 per cent relative humidity.

2. Electrolytic Capacitor Paper. Very porous, absorbent, low density sheets having a thickness from .001 inch to .003 inch are used in electrolytic capacitors. In this type of application the paper serves mainly as a spacer between the electrodes and as an absorbent medium for the electrolyte. This paper is made on a fourdrinier machine from long fibred stock having very little hydration. The fibers used are generally of the Manila family such as abaca, but a number of other pulps such as kraft, kraft mixed with other wood fibers, and rag have been utilized. Bleached fibers are not used owing to the impracticability of washing them free from chlorides which are extremely objectionable because of resulting short life of the capacitors.

3. Cable Paper. Large quantities of paper are used for the insulation of high voltage cables, low voltage cables, and the round and rectangular conductors for a large variety of applications in many forms of electrical equipment such as transformers, coils, voltage regulators, magnets, rotating machinery, etc. All such papers are usually classified as cable papers. They are generally applied spirally on wire covering machines from pads or cops in the form of narrow strips, from 1/64 inch width in the thinner tapes to 3 or 4 inches width in the thicker ones. The covering is done at relatively high speeds and with considerable tension. In order that the paper withstand this operation, as well as subsequent bending of cables and conductors, without tearing, it is essential that the tapes have high tensile strength and stretch in the machine direction, and high crosswise tearing strength.

To obtain the highest values for the above mechanical characteristics, cable papers have been manufactured in large amounts from Manila hemp on cylinder machines. The source of the fiber is largely old rope which is prepared for paper making by cutting, dusting and mild alkaline digestion. Sometimes a small percentage of new hemp is added.

During recent years a number of factors have contributed to changes in the methods of manufacture and the raw materials used for cable papers. In high voltage power cables the paper insulation must be built up to thicknesses as great as one inch in some cases. In order to obtain uniformity and to be able to wind the inner layers under maximum tension, the stock is stored and the entire winding operation is performed in a controlled humidity atmosphere. Kraft pulps have also been improved, particularly in the "light strong," and semi-bleached varieties, so that satisfactory sheets are made from kraft and Manila hemp combinations and from kraft alone. For some applications, these pulps may be used to produce thicker cable papers on a fourdrinier machine.

In addition to the above mechanical characteristics, a number of other requirements must be met in cable papers. When they are used to cover high-voltage cables, a great many layers are applied in order to build up the required dielectric strength. Dielectric losses and consequent heating effects become of importance and as has been shown for capacitor papers considerable work has been done in an attempt to understand the electrical properties of the composite dielectric made up of liquid-impregnated paper.

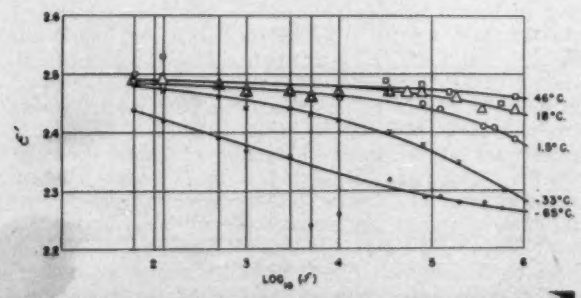

Fig. 7—Cable paper impregnated with 5314 oil. Effective dielectric constant (E') as a function of frequency (f) for different temperatures.

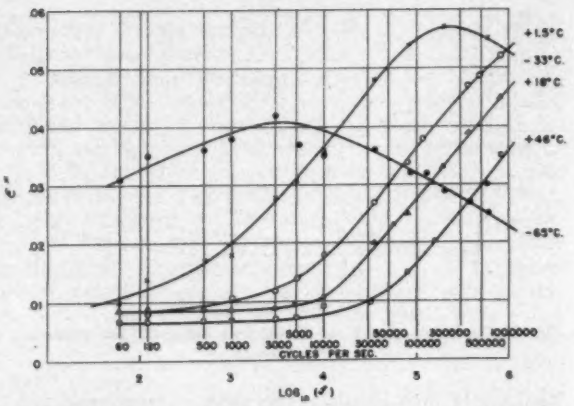

Fig. 8—Cable paper impregnated with 5314 oil. Loss factor as a function of frequency for different temperatures.

Dielectric Constant and Dielectric Loss of Oil-Impregnated Paper

The dielectric constant (E′) of low viscosity mineral oil is roughly 2.2. The dielectric constant of pure cellulose is 6.1 (*6*). The dielectric constant of paper fibers is about 5.5 (*5*) In oil-impregnated paper, if the electrical properties of the two materials were additive, the apparent dielectric constant of the composite would be expected to be between 2.2 and 5.5 in proportion to their volumetric ratio. This is an over simplification (*7*), however, since cable paper forms a porous matrix with oil filling the interstices in the paper sheets and the spaces between sheets so that the paper fibers and the oil filled spaces constitute an unknown arrangement of series and parallel elements having different electrical properties. Also little is known about the effects of adsorption and interfacial forces on the composite electrical properties (*8, 9*). If the paper is in the form of dense sheets, the assumption that the paper is in series with the oil spaces most nearly fits experimental data (*5*). In general, our hope is to understand the mechanisms of capacitance and loss sufficiently well to be able to calculate quantitatively the properties of specific combinations from known characteristics of the constituents.

For example, a low viscosity commercial mineral cable oil (G.E. No. 5314) has a dielectric constant which is independent of frequency between 60 and 10^6 cycles per second and varies with temperature between 0 and 100 deg. C. inversely as the change in density. Furthermore, the dielectric loss in the liquid is very low if it is free from soluble contaminants and water. ($E'' = 0.0002$ throughout the temperature and frequency ranges indicated.)

The dielectric constant and loss factor for dry cable paper are shown in Figures 4 and 5. These data were all taken using a guarded specimen (*10*). Before making the 100 deg. C. measurements the paper had been kept at 105 deg. C. for 18 hours in the test cell which was mounted in a closed cabinet in which was maintained a positive pressure of predried air. After the 100 deg. C. measurements were completed the temperature was lowered for the 56 deg. C. and then the 25 deg. C. measurements without opening the cabinet. Then the source of dry air was stopped and a sulphuric acid and water mixture adjusted to give 60 per cent relative humidity was placed in a tray in the bottom of the cabinet. The paper was allowed 18 hours to reach equilibrium, and remeasured with the results shown in Figure 6.

In Figures 7 and 8 are shown the dielectric constant and loss factor data obtained some time ago on a sample of similar paper dried and impregnated with a similar oil. The cylindrical guarded cell used for these measurements is shown in Figure 9.

It is interesting to speculate on the mechanisms responsible for the above observed characteristics. Referring first to Figure 6 the effect of the re-adsorbed moisture was to increase the apparent dielectric constant throughout the entire frequency range and also to increase the loss factor, particularly at low frequency. Previous investigations (*8, 11*) have shown that an electrical relaxation mechanism is indicated when dielectric constant and loss factor data are obtained, similar in whole or in part to the general curves shown in Figure 10. On the other hand, the electrical data alone will not differentiate between the orientation of polar groups or the translational motion of ions (called polarization) in a non-homogeneous medium.

At low frequency both the dielectric constant and equivalent parallel conductance of water alone should be independent of frequency. Although the water adsorbed on the paper causes major changes in the electrical properties, the forces necessary both to rotate the molecules and to move the ions are different from those which would be required in water alone. This is in confirmation of experiments (*12*) which show that the heat of adsorption of water on dry cellulose is about 50 per cent greater than the heat of condensation of water alone at 25 deg. C. Therefore, we can say that the changes in characteristics shown in Figure 6 are not caused by free water. By subtracting the component of loss factor which represents the d-c. conductance, the dotted curve in Figure 6 is obtained, which is the frequency-sensitive component resulting from some form of electrical relaxation.

Referring now to the data for dry paper (Figures 4 and 5) it appears that the paper itself exhibits characteristics similar to the left-hand portions of the general curves for some relaxation mechanism and that increasing the temperature increases the apparent ease of relaxation and therefore the frequency at which a given change is observed.

Figures 7 and 8 show similar results for oil-impregnated paper as though the low viscosity mineral oil had little effect except to replace air in the paper matrix. This would not be true, however, if the impregnant used were polar or had high viscosity so that it, too, would show relaxation characteristics in the temperature and frequency ranges being studied.

From the above data we see for cable paper that:

(a) *At power frequencies (25 to 60 cycles per second) adsorbed water causes large undesirable increases in dielectric loss.*

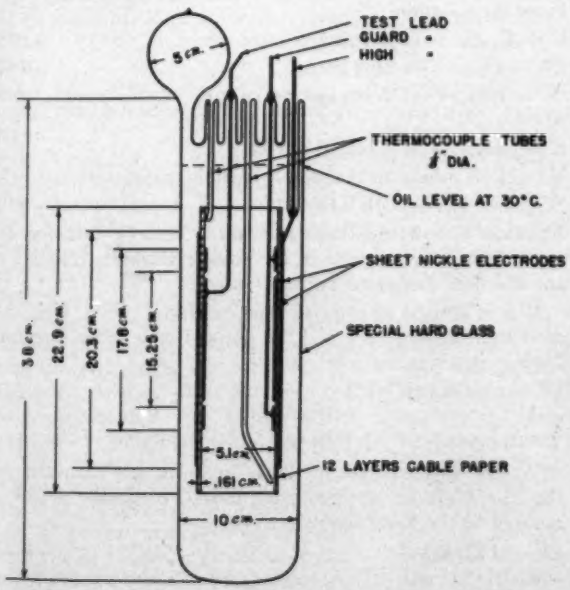

Fig. 9—Cylindrical, guarded cell used for measurements on paper samples.

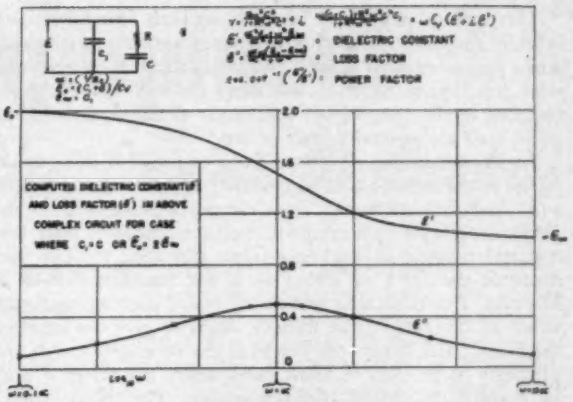

Fig. 10—General relations between dielectric constant, loss factor and frequency in a dielectric showing electrical relaxation properties.

(b) *At power frequencies dielectric relaxation effects are unimportant except at very low temperature.*

(c) *At radio frequencies the effects of moisture are less important than the dielectric relaxation effects.*

4. Coil Winding Papers. Thin papers in considerable quantity are used in the winding of small coils for a variety of applications, as radios, meters, etc. Space is an important factor and the thickness of the sheet generally is between .001 inch and .003 inch. The requirements are largely those given above for dielectric capacitor papers and they are manufactured in much the same manner. Undoubtedly the problem which has been given the most consideration has been the production of a sheet which would not corrode the fine copper wires with which it came in contact, particularly at high humidities and temperatures. Most of the effort was spent in reducing the acidity and the amount of electrolytes present. It has been shown recently (*13*) that the cause of the corrosion is the organic acids produced by the electrochemical oxidation of cellulose itself and that no degree of purification will prevent this reaction. These findings agree with the experience of other investigators who have tried papers made from all sorts of pulp at various acidities.

5. Saturating Papers. Large quantities of porous, absorbent papers are used for the manufacture of resin and shellac impregnated plates and cylinders. Such papers are generally manufactured on a fourdrinier machine from kraft, rag, or alpha pulps. Their principal functions are to contribute mechanical strength, resiliency, and high dielectric strength through the process of lamination.

6. Layer Insulation. In the process of winding electric coils, it is usually necessary to arrange the conductors in multiple layers. The electric voltage between these layers is many times higher than the voltage between adjacent turns. Therefore, sheets of paper are wound into the coil between the layers to provide the added insulation. The major requirements of layer insulation are high dielectric strength, toughness, type of finish, and freedom from conducting particles. This last requirement is so important that the conducting particle test is applied to 100 per cent of the material not only to control mill production but also to locate and eliminate defective sections. For this reason, the pulp for this type of paper must also be passed through centrifugal separators.

The surface finish is important in certain types of applications. In some cases it is necessary that the surface be sufficiently rough to hold the wire in place and prevent collapsing. In other cases a smooth surface is desirable in order that the wires may be slipped into the proper position at the time of winding. For different applications, papers are required having rough, machine calendered, super-calendered, glaze rolled, and water finishes.

This type of paper may be made on both fourdrinier and cylinder machines. The latter machines are used particularly when papers must be supplied with high stretch in the crosswise direction in order to withstand the folding operations required in the assembly of units such as transformers. The pulps used are generally kraft or rag.

7. Pressboards. Pressboard is a material of wide application in the manufacture of electrical equipment as a spacing and insulating medium. True electrical pressboard in the generally accepted meaning of the term, includes only that material ranging in thickness from .005 inch to .125 inch made in the form of sheets on a wet machine. There is, however, a considerable amount of board used as insulation which is laminated from thinner sheets to give the required thickness. The latter does not have the necessary stretch and pliability to be used in many cases where the material must be molded or formed at sharp angles. The thinner pressboards up to approximately .032 inch have in recent years been made on a cylinder machine in continuous rolls. In the manufacture of many forms of equipment, the process is simplified by having the pressboard in the form of rolls which can be fed through automatic machinery. It was to meet this need that continuous rolls of so-called pressboard were developed. It should be pointed out that this material, dried over dryer rolls under tension, is not equivalent in all respects to the sheet form which has been dried under conditions where free shrinkage in all directions is possible. The writers are of the opinion that the word "presspaper," which has been applied by some manufacturers to the roll form, should be generally adopted to avoid confusion.

The pulps used range all the way from 100 per cent rag through various combinations of rag and wood pulp to 100 per cent kraft fiber. In the thinner sheets it has generally been 100 per cent rag or a 50-50 mixture of rag and kraft. In the thicker pressboards 75 per cent rag and 25 per cent kraft fiber are generally used.

There are two finishes in general use. These are glaze rolled finish and a calendered finish. The former is applied to pressboard up to about .025 inch in thickness, while the latter finish has been used on all thicknesses.

The most important requirements in electrical pressboards are high dielectric strength, toughness, moldability, uniformity of thickness, and freedom from impurities. Referring to the last requirement, experience has shown that sodium and aluminum resinates resulting from the use, in pressboard manufacture, of scrap papers sized with rosin and alum, cannot be tolerated because of their contaminating influence on impregnating liquids, such as Pyranol.

Chemical Deterioration of Paper Insulation

Most electrical insulating materials are operated at elevated temperature; in fact the temperature limits around which electrical apparatus is designed might be raised considerably with attendant savings in size and material cost if insulating materials did not deteriorate with time at elevated temperatures. Therefore, pyrolysis or the integrated time effects of prolonged heating are of extreme importance (*14*). The conditions under which electrical insulation is operated are extremely varied. Many machines are open to air so that oxidation is an important factor in chemical deterioration. Other types of apparatus such as capacitors, cables and hydrogen-cooled generators are essentially oxygen free. Nevertheless, all cellulosic materials deteriorate with time at elevated temperatures even though oxygen is absent. Many accelerated tests have been devised to show the relative stabilities of different insulation systems at elevated temperatures, but few quantitative data are available showing the chemical reactions and their rates which contribute to such deterioration (*15*).

In oxygen-free oil-impregnated paper operating at high electrical gradients and at 100 deg. C. we have found chemical reactions with metals which were not anticipated and localized deterioration leading to high dielectric losses and eventual failure (*16*). Since the mineral oil, if oxygen-free, does not deteriorate appreciably under these conditions even in the presence of metals, we suspect that such deterioration results from decomposition of the paper.

For these reasons we believe that in the future considerable effort should be expended on chemical studies of rates of decomposition of paper and other organic insulating materials with and without oxygen with the hope of learning how to materially reduce the rate of decomposition at operating temperatures.

Acknowledgment: The authors wish to acknowledge the assistance of a number of individuals, particularly M. Guarnier and S. I. Reynolds, in obtaining some of the data presented.

APPENDIX

The loss factor E″ is a scalar coefficient which is a direct measure of the rate of heat generation per unit volume of a material caused by the dielectric loss in this material, and can be determined either from an equivalent electric circuit or directly from the physical dimensions of the material being measured, the voltage applied, and the power dissipated.

It has been found convenient to interpret all bridge or substitution measurements on liquid, solid, and composite dielectrics in terms of the equivalent parallel circuit of the measuring equipment. The complex expression for the reciprocal impedance of the measuring circuit is given by the relation:

$$1/Z = G_x + i\omega C_x + \omega C_v (E'' + iE') \qquad (1)$$

Where

G_x = the equivalent parallel conductance of the sample.

C_x = the equivalent parallel capacitance of the sample.

$\omega = 2\pi f$; f = frequency in cycles per second.

$i = \sqrt{-1}$

$C_v = 0.08842 \times 10^{-12}(a/l)$ = capacitance of the same geometric arrangement of electrodes in vacuum, in which a = effective cross-sectional area of sample in square centimeters and l = effective length of sample.

From the equation 1,

$E' = C_x/C_v$ = Dielectric Constant (2)

$E'' = G_x/\omega C_v$ = Loss Factor (3)

$W' = E^2 G_x/V$ = Watts loss per cu. cm. (4)

where

E = total applied potential in volts

V = al = volume of the sample in cubic centimeters

$W' = 0.555\,(10)^{-12} E'' f\,(E/l)^2$ (5)

Equation 5 shows that the coefficient E″ can be obtained directly from measurements of the voltage gradient, frequency, and the heat dissipated per unit volume.

If it is desired to correlate the loss factor (E″) with the dielectric constant (E′) and the power factor (PF), the following relations are used:

$PF = \cos \cot^{-1}(E''/E')$ (6)

and

$W' = 0.555\,(10)^{-12} f\,(E/l)^2 E' \cot \cos^{-1}(PF)$ (7)

For low-loss materials in which the cosine and cotangent of the loss angle are approximately equal, equations 6 and 7 reduced to the more familiar forms:

$PF = (E''/E')$ (6a)

and

$W' = 0.555\,(10)^{-12} f\,(E/l)^2 E'\,(PF)$ (7a)

(*For Literature Citations, turn to page* 800)

Steam Plant Equipment

in the Paper Industry

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▶▶▶ THERE IS NO FIELD which offers larger opportunities for cost reduction in the power plant than the paper industry. The paper-making process requires the use of relatively large quantities of steam and power. Chemical pulp mills are also large steam consumers. Paper mills and mills which produce pulp, either chemical or groundwood, consume large amounts of power.

An ideal situation with respect to economical power generation exists when the manufacturing process has need for both steam and power, especially when steam can be utilized at low pressure. In such a case the steam can be used first for power generation before it is delivered to the process. The cost of power so generated is exceedingly low.

The greatest economies in the generation of steam power result from the use of high pressure steam. Many of the larger plants in the paper industry have been prompt in the adoption of high steam pressures. The typical small plant, however, still operates with low pressure boilers. The reasons for this may be summed up as follows:

1) Lack of appreciation by the management of the economies possible with modern power plant equipment.
2) Lack of interest in the power plant. (The "necessary evil" attitude.)
3) Lack of capital.
4) Fear of complicating plant operation.

It is difficult for a plant manager, not familiar with the present state of the art of steam and power generation to believe that in many cases it would pay to scrap a portion, or all, of his power plant and replace it with modern high pressure equipment, even when the life and usefulness of the present plant is far from exhausted. One often hears the argument that because the existing plant has not been fully depreciated, the undepreciated value of the old plant should be added to the estimated cost of the new plant when comparing the operating costs. There is a hidden fallacy in this reasoning. Depreciation of both old and new plant is, of course, a factor in operating cost, but when the indicated savings due to new equipment will pay a fair return on the cost of such new equipment, there is no justification for taking into consideration the continuing depreciation of the old plant.

Admittedly, the *earnings* of capital invested in the new plant should be sufficient to pay a fair return on both the undepreciated value of the old plant and the cost of the new one. What we are considering here, however, are incremental earnings; in other words "savings" in operating cost. The incremental earnings should be required to pay a fair return only on the incremental investment; that is, the cost of the new plant.

To take an extreme case, let us suppose that a brand new boiler has been installed, costing $20,000. Even before this boiler has started in operation, it is discovered that a boiler of more advanced design could have been installed for the same cost, and would have consumed $5000 less fuel per year. An additional investment of $20,000 in the more modern boiler would, therefore, yield a 25 per cent return on the new investment, without any regard to the depreciation charges on the other boiler. It would pay to shut down the first unit and leave it idle even if it had never made a pound of steam. It is unlikely that any case would be encountered in practice exactly similar to the foregoing, but it frequently happens that plant managers are reluctant to discontinue the operation of equipment only ten or fifteen years old, even when they are fully convinced that they can install new equipment which will save them in annual operating expense up to 25 per cent of its cost.

Again, there is the argument that even after 30 years of operation, some power plants function dependably, and with no serious increase in maintenance cost. Such plants, however, operate at far lower efficiencies than modern plants; a penalty is being paid in high operating costs.

Oftentimes the *laissez faire* attitude of management toward the power plant is due to the feeling that the profits of the company come from the sale of paper. The executives are skilled in their art and are not familiar with technical aspects of steam and power production. In such cases the power plant suffers from neglect. The engineer may plead on bended knee for some needed improvement, but he is told that he must make the best of what he has for awhile at least. Thus the evil day is deferred until the insurance inspector sounds a note of warning and threatens a reduction in the steam pressure.

New power plant equipment requires a comparatively large capital outlay, but it also pays large dividends. Many manufacturers will sell on the deferred payment plan. This plan, however, is never as satisfactory to the buyer as purchase on usual terms. The returns from modern high pressure equipment are usually large enough to pay the interest on borrowed capital and return the investment in a few years, often in two or three.

Although studies are required of each individual plant before specific recommendations can be made, it is safe to say that the average medium or small size plant can be operated with one boiler on the line. A reserve is, of course, desirable. Such reserve, however, may be either a duplicate of the boiler in service or it may consist of the old equipment which has been displaced.

Modern boilers are so designed that large capacities are obtained with small dimensions. This does not imply "overloading" as in the case of older types of units. Designs are available which will permit the installation of a single boiler in an existing boiler house, without building alterations, the boiler having sufficient capacity to displace three, four and sometimes more of the old units.

When power is generated by low pressure steam, say 150 lb., the use of high pressure steam will reduce materially the total quantity of steam which must be generated. This statement assumes that the demand for power necessitates either the use of condensers or the exhaust of steam to the atmosphere.

When electric power is purchased, high pressure steam makes possible a considerable reduction in the amount of purchased power, or its complete elimination. The cost of self-generated power will almost invariably be materially less than the purchased power, the amount of savings depend-

ing on how much "by-product" power can be produced by the process steam. Even when little "by-product" power can be produced, the cost of power from condensed steam, if generated at high pressure, is usually less than that of purchased power.

Fear of complicating the operation of the power plant and the need for higher grade operating personnel is probably the principal reason for failure to modernize the medium size plant; yet the modern plant operates in most cases with less outage, less need for personal attention and with less need for repairs than older equipment. The operators, admittedly, must be of more than average intelligence, but the operation of modern high-pressure equipment is not as exacting as is generally supposed. Certainly large savings warrant the employment of higher priced supervision.

The successful operation of high pressure boilers and turbines depends primarily on the maintenance of scale-free evaporating surfaces, and the delivery of clean steam. The treatment of boiler water for maintaining the required conditions to insure complete freedom from scale, corrosion and embrittlement of the boiler, is now possible by following a procedure specified by competent specialists in boiler water conditioning. Clean turbines will result from the use of clean steam. Steam purity results partly from proper boiler design and the use of steam purification equipment, and partly from proper control of boiler water conditions.

Automatic combustion control has developed to a point where reliance can be placed upon it for maintaining high boiler efficiency over long periods, even under widely varying load conditions, thus relieving the operators of many duties, and freeing them for the task of maintaining their equipment in first class condition.

Maintenance of boilers has been reduced almost to the vanishing point through the use of water-cooled furnaces and steel-clad airtight settings. Modern boilers are set singly and arranged for convenient removal of furnace ashes. When conditions warrant, ash removal equipment will minimize the amount of labor required as will also coal handling equipment.

Instruments play an important part in the successful operation of modern boilers, turbines, and generators. Their momentary indications and permanent records acquaint the operator with those conditions which are vital to the plant. A gradual increase in the temperature of the stack gases warns of fouled evaporating surfaces or excessive gas quantities. A sudden dip in final steam temperature may warn of serious water carry-over in the steam. Rising temperature of steam boiled or exhausted by turbines is a sure indication of lowered turbine efficiency. On the other hand, proper indications by the instruments is assurance to the operator that his equipment is in good order and functioning at its best.

Modern steam plant equipment incorporates in its design and construction the best engineering principles. As a result it possesses features of safety and dependability which are lacking in the old designs. A good example is the use of welded boiler drums in place of those of riveted construction. No longer is there any doubt about the strength of a seam. Leakage and the use of the caulking tool have been abolished.

High steam pressures are here to stay; in fact pressures considered high ten years ago are thought of today as only moderately high, or even low. Steam temperatures have risen less rapidly, but as new alloys are developed for steam lines, valves, and turbine parts, the ceiling will be raid. To attain a high degree of operating efficiency it is not necessary for the average plant to go to the limit of either pressure or temperature; in fact it is advisable to make the selection in the range wherein the operation of hundreds of industrial plants is proof that the equipment can be operated safely, dependably and economically.

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(*Continued from page 798*)

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TONS OF COAL IN LOOSE PILES

W. F. SCHAPHORST, M. E.

▶▶▶ WHEN BITUMINOUS COAL is piled in a conical pile, the tonnage in the volume is easily estimated from the formula $.00248D^3$. The formula for estimating the tonnage of anthracite coal in a pile of the same shape is $.00172D^3$. *D* in each of the two formulae is equal to the diameter of the pile in feet at its base.

The tonnage of bituminous coal in an elongated pile can be estimated by using the formula — $.00248D^3 + .00474AD^2$. In this case, A equals the length of the crest on top of the pile in feet; *D*, the maximum width in feet of the base of the elongated pile. A good way in which to determine the length of the crest is to subtract *D* from the total length of the pile at its base.

It is obvious that an elongated pile can be cut up into three parts. The two curved end portions when added together give a simple cone, hence the $.00248D^3$ in the formula. The central portion has a triangular section from end to end, and its volume is one-half as great as the volume of a rectangular block having the same base and height. The tonnage in this central triangular portion is $.00474AD^2$. The formula thus becomes $.00248D^3 + .00474AD^2$.

Where the coal in the elongated pile is anthracite instead of bituminous, the formula is: $.00172D^3 + .0033AD^2$.

In each of these formulae, as previously mentioned, D and A are measurements in feet. Likewise, all of the formulae are based on the fact that one ton of coal occupies approximately 38 cubic feet on the average, whether bituminous or anthracite; that the natural cone of anthracite is 0.25 as high as it is in diameter at its base, and that the height factor for bituminous coal is 0.36.

Caught in the Nip

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National Safety Council

How important is the nip hazard in the accident experience of the paper industry, and what are the outstanding circumstances and causes of nip accidents in paper mills?

▸▸▸ "JOE JUST GOT CAUGHT in the calender stack and his arm's torn off!" These words spread quickly around the mill. Later, everyone in the small town heard the sad news.

The mill manager visited Joe regularly at the hospital, and helped his family. When Joe recovered, he saw that Joe had a job with a living wage. After all details of the accident had been cleared up, including several thousands of dollars in compensation and medical expenses, the mill manager said with relief, "I'm glad that doesn't happen often!"

Doesn't it? Perhaps not in any one mill. But let's examine the experience of a number of mills. The nip formed by paper machine rolls, rewinders, and other similar equipment figured in 10 per cent of the lost-time injuries in 150 of the safest organizations in the paper industry last year. If such accidents occur so frequently in these mills, the experience of others that have not given close attention to accident prevention for years is probably worse.

But perhaps you say, "Only 10 per cent—not much!" Accidents, however, occur in hundreds of ways, and when the percentage of injuries due to a single hazard runs into two figures, the accident statistician has uncovered a "sore spot." This is especially true when the hazard is one which usually results in serious injuries as does the nip hazard. It ranks as the industry's foremost specific accident hazard on the basis of the number and severity of injuries.

The problem is a challenge to the industry. Efficient accident prevention requires the elimination of outstanding hazards first, in order to achieve maximum reductions in the frequency and severity of injuries. It is also fundamental to base corrective measures on a study of the circumstances, conditions, and causes involved in accidents that have occurred. First, then, under what circumstances do these accidents usually occur?

Joe's accident was a typical one. He was feeding paper into the calender; he slipped on a smooth footboard; and his hand was drawn into the nip. Feeding and threading paper are the principal duties being performed when accidents occur, figuring in about one-third of nip injuries. While slipping was important in Joe's injury—and often contributes to nip accidents—slipping was incidental to the accident. He was caught and injured by the nip. Of course, slipping should be prevented by the use of rough or non-slip material.

Machine hands and windermen also are injured frequently in cleaning rolls or removing wads of paper or broke. Feeling for wrinkles and making adjustments, such as straightening a felt, are third in importance. These are ordinary and frequent duties and, therefore, safety in their performance is especially important. If the dangers of such work can be mostly eliminated, the nip hazard will be reduced considerably.

The difficulties are principally mechanical, according to reports. Unsafe conditions outnumber lack of knowledge of safe practices, violations of instructions, haste, and other causes of unsafe actions by employees. Specifically, the most important mechanical causes are:

1) Lack of adequate guarding, especially of winders.
2) Lack of mechanical feeds, such as rope carriers or air ducts for blowing the tail into the next nip.
3) Unsafe design and arrangement of equipment, such as insufficient space between reels and winders.
4) Lack of safe tools for cleaning rolls or removing wads of paper or broke, particularly from the standpoint of preventing injuries when scrapers, air hose and sticks are suddenly drawn into the nip before the employee releases his hold.

The responsibility for equipment and operating methods which expose the employee to a minimum of danger, of course, rests on management. The installation of safety devices, and changes in design, arrangement and methods of operating equipment cost money and often involve consideration of effects on production. Is it possible to save such expenditures by depending upon the employee to avoid the hazard? Let us examine the part of employees in the occurrence of nip accidents.

Employees with years of experience are often caught. One of their common unsafe acts, arising out of temporary failure to keep safety uppermost in their minds, is attempting to remove a wad of paper ahead of a nip with the hand instead of using a stick or other tool. Supervisors, on the other hand, sometimes fail to correct unsafe practices and to train men thoroughly in safe working habits. The outstanding cause involving the behavior of experienced men, however, is violation of instructions.

The nip takes a particularly heavy toll among new and inexperienced men. The reasons for the accidents are the usual ones. Some men are unfitted mentally and physically for the work. Violations of instructions, however, are not as frequent as among older employees. Most injuries to new men occur before they have acquired sufficient knowledge and skill in the work.

These factors point to the possibility of reducing nip accidents through more effective selection, training and supervision. This single approach to overcoming the hazard, however, neglects the fact that lack of mechanical protection figures in the majority of nip accidents. It also overlooks the fundamental principle that the elimination of a hazard through engineering is the most effective safety measure.

EDITOR'S NOTE: Detailed information on how to eliminate this hazard is given in *Hazards of In-Running Paper Nips*, published by Employers Mutuals, Wausau, Wis., and in Data Sheet PP1, *Drum Type Reels*, published by National Safety Council, Chicago.

pH NOMOGRAPH *for Industrial Alkalies*

D. S. DAVIS[1]

▸▸▸ RELIABLE DATA covering the *p*H values of dilute aqueous solutions of the common alkalies are of considerable value in view of the industrial importance of alkalies and in particular their widespread use in the paper industry. Such data are at last available in "Wyandotte Caustic Soda," a booklet distributed by the Michigan Alkali Company, Wyandotte, Michigan, and deal with concentrations of 0.1 to 10 per cent of $Na_2B_4O_7$, Na_2CO_3, Na_3PO_4, Na_4SiO_4, KOH, and NaOH. *p*H is shown to be linear with the logarithm of concentration for Na_2CO_3 over the entire range and for the others up to about 1 per cent. This relationship and the use of a specially derived concentration scale above 1 per cent enables construction of the accompanying line co-ordinate chart which facilitates interpolation. The chart, then, can be said to depend upon the following relationships:

$$pH = a + b \log C$$

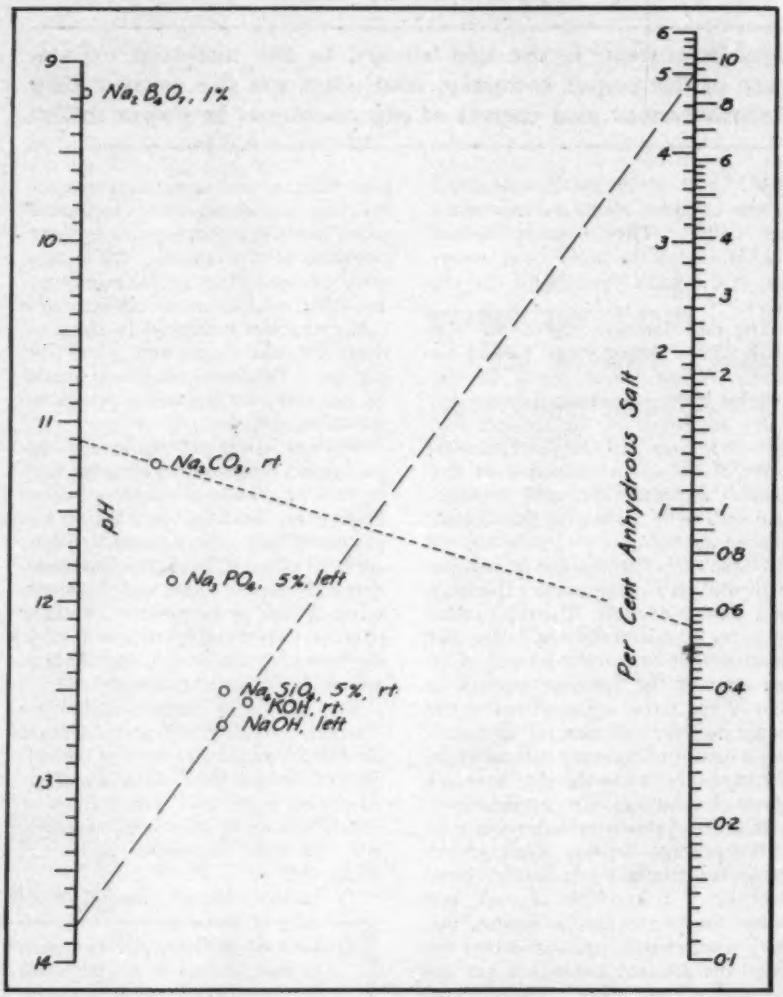
and $$pH = a' + b' f(C)$$

where C is percentage concentration and a, b, a′, and b′ are constants specific to the alkali.

In the legends, "left" and "rt." refer to the scales at the left and right of the concentration axis. These are identical between 0.1 and 1 per cent, requiring only one to be given, but differ increasingly between 1 and 10 per cent. The dotted line indicates that an aqueous solution containing 0.55 per cent of anhydrous Na_2CO_3 has a *p*H of 11.11 while the dashed line shows that a 5 per cent solution of NaOH tests 13.80 in *p*H value. The percentages appearing after some of the formulas indicate the maximum concentrations for which the chart is to be used.

The nature of the agreement between the original data and *p*H values as read from the nomograph is shown in the table where parallel columns of observed and calculated *p*H values for several concentrations of each alkali are listed. As stated in "Wyandotte Caustic Soda" the alkalies used in the original investigation were all of technical grade and the concentration values are subject to some slight variation depending upon the origin of the material.

(1) Wayne University, Detroit, Michigan.



pH of Aqueous Solutions of

Per cent Conc.	$Na_2B_4O_7$		Na_2CO_3		Na_3PO_4		Na_4SiO_4		KOH		NaOH	
	Data	Chart	Data	Chart	Data	Chart	Data	Chart	Data	Chart	Data	Chart
0.1	9.14	9.14	10.85	10.85	11.50	11.50	12.05	12.05	12.05	12.02	12.29	12.29
0.3	.....	.....	11.01	11.02	11.71	11.72	12.42	12.41	12.49	12.47	12.66	12.66
0.6	.....	.....	11.12	11.13	11.85	11.85	12.65	12.65	12.77	12.76	12.90	12.89
1.0	9.15	9.15	11.20	11.20	11.95	11.95	12.82	12.82	12.97	12.97	13.06	13.06
2.0	.....	.....	11.30	11.30	12.10	12.11	13.05	13.05	13.25	13.26	13.34	13.34
3.0	.....	.....	11.36	11.36	12.23	12.22	13.20	13.18	13.42	13.43	13.53	13.52
5.0	.....	.....	11.45	11.45	12.45	12.38	13.42	13.36	13.65	13.64	13.82	13.80
7.0	.....	.....	11.50	11.50	.....	.....	.....	.....	13.82	13.77	.....	.....
10.0	.....	.....	11.55	11.55	.....	.....	.....	.....	14.00	13.93	.....	.....

PAPER SKETCHES

OLD PAPYRUS SCROLLS DUG FROM RUINS, WERE CHOPPED UP AND USED AS INGREDIENTS IN MEDICINE BY ARABIAN CHEMISTS OF THE TENTH CENTURY!
AT ENGLISH EVENING PARTIES OF THE 1870'S, DELICATE CONFECTIONS WERE SERVED THE LADIES IN PAPER CUPS TO PREVENT SOILING OF THEIR GLOVES.
195,074 TONS OF WOOD PULP ACCORDING TO THE U.S. BUREAU OF THE CENSUS WERE USED IN 1939 IN THE PRODUCTION OF RAYON.
ARTIFICIAL LIMBS WERE FASHIONED FROM PAPIER MACHÉ AS EARLY AS THE 1860'S.

ADVERTISING PAGES REMOVED

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BEHR-MANNING, TROY, N.Y. (DIVISION OF NORTON COMPANY)

▶▶▶ SAFETY AND NATIONAL DEFENSE kept step throughout the entire gathering of the Twenty-ninth Annual Congress of the National Safety Council in Chicago the week of October 7. With the other side of the world enacting one of the most critical chapters in the earth's history, the peaceful, busy metropolis on the shore of Lake Michigan seemed far away from the holocaust that fills the air waves and the daily press. More than 10,000 delegates taxed the capacity of the Stevens Hotel, famed convention headquarters.

Symbolic of this country's protection from aggression, the delegates were inspired by the exhibit which greeted them in the lobby of the Stevens Hotel. A large replica of Fort Dearborn (see page 766) had been done in sugar by the chef of the Hotel, and it bore a true resemblance to authentic models. The site of one of history's most potent bulwarks is now surrounded by the second largest city in this country, and only a few blocks from this landmark —one of the most sacred in U. S. history—the largest organized safety body gathered to consider the problems and the progress of safety in the lives of the people of this country.

The annual meeting of members, which was the opening general session of the Congress on Monday morning, filled the Grand Ballroom. It was fitting that the meeting should open with the national anthem. The Stars and Stripes and Canadian flags were draped back of the speakers' platform and the effect was not only impressive but it brought to everyone present a deep reverence for our country and the principles upon which it has been built. It is still "the land of the free and the home of the brave."

Col. John Stilwell, president of the National Safety Council, welcomed those who had met in this gathering with a hope that they look away from the world situation long enough to give special attention to safety matters so that our country can produce materials needed for national defense without interruption.

The president's address stressed the point that the National Safety Council has a two-fold duty: (1) to secure acceptance of safety ideals by more persons, groups and organizations, and (2) it must make available to them the information and materials with which to realize these ideals.

Colonel Stilwell dwelt on the strengthening of the Council; the increased membership and the broader programs of safety that are developing. He pointed out that accidental deaths have increased so far in 1940 due, somewhat, to increased travel on highways and increased employment in industry. Many industrial plants, he pointed out, made gratifying progress during 1939, the average frequency rate reporting to the Council being decreased 5 per cent from 1938.

Colonel Stilwell also pointed out that individual cities are continuing to establish records in preventing motor vehicle accidents and that many companies, fleets, organizations and other groups have also been successful.

"One job that is cut out for us," said Colonel Stilwell, "is to increase the number of companies, cities, states, schools, civic organizations and individuals organized and working for safety. Each safety-minded unit needs to become a nucleus around which others will grow until safety becomes a national ideal and way of life."

The Council's president reported that the Council executive committee recently passed a resolution offering the Council's services to the Federal Government and other agencies engaged in defense activities.

"We need great numbers of new safety workers in every field of accident prevention, literally thousands of new men and women who will devote themselves to accident prevention problems," said the Colonel. "Here our job is two-fold: finding and creating specific jobs which will attract these people and enable them to serve efficiently, and training the people and placing them where they are needed."

At the conclusion of Colonel Stilwell's address he introduced General Charles H. Bonesteel, Chief of Staff of the Second United States Army, whose subject "Safety and War," took up the many phases of safety activity in the Army, in all of its various branches.

The General told how recruits learn personal hygiene and camp sanitation and, contrary to popultr opinion, assured the audience that the soldier is not fed on hardtack and beans but on a balanced diet.

He said that leadership in group health is not attained by any complicated method but by practice of preventive medicine through the medium of simple, well-established methods and means which have been proved neces-

EDITOR'S NOTE: All of the photographs used with this article, as well as those used on the Theme Page of this issue were supplied through the courtesy of the National Safety Council's Chicago staff.

sary for the well being of any group.

The speaker then illustrated other safety methods employed by combat units, anti-aircraft units, etc.

Protective coloring, nature's safety methods, is employed by the Army, the General pointed out, showing how troops use drab uniforms to be inconspicuous in open country and fields and white uniforms in snowy country.

The army's air corps is also safety minded, it was brought out. Year after year in co-operation with manufacturers and civilian agencies the Army has ever sought better, faster and safer planes. The men who pilot these planes are selected according to very high standards and are given rigid and thorough training.

It was an Army engineer, Colonel George W. Goethals, who completed the Panama Canal through which millions have traversed in safety.

"In the camps and forts close at home; in far away Alaska and in the Philippine Islands . . . in fact wherever there is a unit or detachment of the United States Army," declared General Bonesteel, "our officers and enlisted men are ever on the alert to perform their duties with the maximum safety to themselves, to government property and to the civilian population."

Speaking on the subject "Conserving our Greatest Asset—Man Power," W. E. Mitchell, vice president and general manager of the Georgia Power Company, Atlanta, Georgia, gave the closing address before the annual meeting.

If the national defense program is a challenge to America's system of mass production, it is also a challenge to safety, was the main thought brought out by Mr. Mitchell.

Mr. Mitchell emphatically stated that safety programs must be genuine to be effective; they must be developed through high morale and *esprit de corps*. He said that appealing to the emotions can be used effectively in safety work and that more human understanding, rather than wishful thinking, is needed to carry this out.

After relating some of his experiences with accidents, Mr. Mitchell told the audience that the "time is desperately short" to complete the national defense program and that in the training of men, not only as soldiers and sailors, but also as mechanics and workmen, safety must be taught as well. He emphasized the fact that conservation of man power depends on a sound safety program.

"Management must realize," Mr. Mitchell said, "that the functioning of the safety program is just as important to efficiency in the plant as any other major activity. Accidents are pure waste of men, materials and money."

Colonel Stilwell, president of the National Safety Council, made a stirring address at the Annual Meeting of Members.

Colonel Stilwell Re-elected

The banquet on Wednesday night was as usual a gala affair. Topping all the festivities of this occasion, the highlight of the banquet each year is the announcement of the Council's next president. There was deep satisfaction and applause when the company was informed that Colonel John Stilwell had been re-elected president of the Council.

Colonel Stilwell, presiding at the banquet, introduced the speaker of the evening, Dr. Allen A. Stockdale, National Association of Manufacturers, New York City, and Trustee of Emerson College of Oratory, Boston. Dr. Stockdale is an author of note and has traveled around the world. He is considered one of the most eloquent and best informed speakers in this country, and it was a rare privilege for those who attended the banquet to hear him.

PAPER AND PULP SECTION

D. B. Chant, general chairman of the Paper and Pulp Section, opened the first session on Monday afternoon to a gathering that completely filled the assembly hall where the meetings were held. The Chairman spoke warmly of the friendly spirit and devotion to the cause of safety that had brought members of the Section from many states and from Canada. After each of those present had followed the custom of rising and introducing himself, Chairman Chant proceeded to deliver his annual report.

Progress and Activities

He reviewed the accomplishments of the past year with satisfaction for the progress that has been made. And progress has been made even though increasing disturbances have pushed forward since the Congress met in Atlantic City a year ago.

Chairman Chant reported that 24 new memberships had been received during the year, which, with a withdrawal of 18 members raised the total membership of the Section to 232. He dwelt upon the value of the contest and the *News Letter*, and expressed deep appreciation for the work done by the officers and committees of the Section, and for the co-operation and untiring efforts of the Executive Committee and headquarters staff of the National Safety Council.

Following the Chairman's address, the opening session was well under way and the afternoon was devoted to three highly interesting talks that had been scheduled. The first subject "Safe Handling of Materials," was treated by two speakers: (a) Bulk materials, (b) Unit materials. J. F. Robertson, personnel director, Crown Willamette Paper Company, Camas, Washington, had prepared the first paper, but as Mr. Robertson was unable to be present, his paper was read by Chairman Chant. The second part of the subject dealt with materials such as rolls, bales, laps, crates, skids, boxes, etc., and was presented by J. A. Long, superintendent of Bay West Paper Company, Green Bay, Wisconsin. Mr. Long's talk was accompanied by a number of slides. *(Several of these slides are illustrated with Mr. Long's remarks under "Convention Papers—Abridged" in this issue.)*

The last speaker, F. W. Braun, of the Employers Mutuals, Wausau, Wisconsin, reviewed the 1939-1940 Accident Experience.

New Officers

The Tuesday afternoon session was given over partly to the reading of scheduled papers, special committee reports and the report of the Nominating Committee. A. Scott Dowd, chairman of this committee, read the list of officers prepared by the committee. The slate was accepted by a unanimous vote. New officers elected for the coming year are as follows:

General Chairman—D. B. Chant, Ontario Pulp & Paper Makers' Safety Association, Toronto, Ontario.

Vice Chairman in Charge of Membership—Clayton O. Braatz, Marathon Paper Mills Co., Rothschild, Wis.

Secretary and Program Committee Chairman—Roland W. Richardson, The Gardner-Richardson Co., Lockland, Ohio.

News Letter Editor—J. F. Berry, Alton Boxboard Company, Alton, Ill.

The following committee chairmen will serve for the coming year:

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Contest Committee Chairman—A. Scott Dowd, Fritz Publications, Inc., Chicago.

Data Sheet Committee Chairman—R. G. McGivney, Oswego Falls Corp., Fulton, N. Y.

Engineering—Safe Practices Committee Chairman—Julius A. Draper, Consolidated Paper Corporation, Ltd., Grand'Mere, P. Q.

Health Committee Chairman—Dr. Louis H. Frechtling, Champion Paper and Fibre Company, Hamilton, Ohio.

Statistics Committee Chairman—Fred W. Braun, Employers Mutuals, Wausau, Wisconsin.

Publicity Committee Chairman—Walter A. Strong, Menasha Products Division of Marathon Paper Mills Company, Menasha, Wisconsin.

Safety Instruction Card Committee Chairman—R. W. Croucher, Minnesota and Ontario Paper Company, International Falls, Minnesota.

Visual Education Committee Chairman—L. R. Simpson, Brown Paper Mill Company, Monroe, Louisiana.

Two speakers were scheduled for the subject "Practical Uses of Accident Cost Data in the Safety Program." The first speaker, Earl E. Grant, president The Crystal Tissue Company, Middletown, Ohio, treated the subject from the viewpoint of the senior executive, while Julius A. Draper, Safety director, Consolidated Paper Corporation, Ltd., Grand 'Mere, Quebec, covered it from the viewpoint of the safety director. *(Abridgments of these two talks may be found in this issue under "Convention Papers—Abridged.")*

The Wednesday afternoon session was given over to a joint session with the Wood Products Section. J. C. Wilson, vice president of the Lumbermen's Mutual Casualty Company, Chicago, and general chairman of the Wood Products Section, presided.

Before the scheduled program of this session got under way, two films were shown. One was shown by a representative of the Illinois Department of Labor; the other, sponsored by the Western Pine Association, was shown with comments by W. D. Jenkins.

Both of these moving picture films were highly interesting and evoked some discussion from those present.

The subject of the afternoon session was "Safety from Woods to Mill," and remainder of the entire session was given over to a panel discussion of this subject which was analyzed as follows: (a) General Operations; (b) Felling and Cleaning; (c) Swamping; (d) Loading, Transportation and Unloading. The five participants who took part in this discussion were: J. E. Cantin, safety director, Quebec North Shore Paper Company, Baie Comeau, Quebec; Harris Flaherty, field officer, New Brunswick Accident Prevention Association, Dalhousie, New Brunswick; R. H. Stafford, safety director, Chapman & Dewey Lumber Company, Marked Tree, Arkansas; G. R. Vaughan-Evans, employment supervisor, Anglo-New Foundland Development Company, Ltd., Grand Falls, Newfoundland; C. E. Wilds, superintendent, Wood Operations, The Brown Paper Mill Company, Inc., Monroe, Louisiana.

Earl E. Grant, president of The Crystal Tissue Co., and a past president of the Paper and Pulp Section, addressed the Section on the senior executive's viewpoint of the subject "Practical Uses of Accident Cost Data in the Safety Program." Chairman Chant is shown at the left.

LUNCHEON

The Luncheon Meeting might well be termed the climax of the year's work for at this meeting all records are announced and awards given to mills that have topped the others in safety performance during the term of the contest. Following the luncheon, Chairman Chant announced that the time had come to present the data on the contest, and called upon A. Scott Dowd, chairman of the Contest Committee, to give his report.

J. A. Long, Bay West Paper Co., spoke on the safe handling of unit materials. Mr. Long illustrated his talk with a number of interesting slides.

The first part of Mr. Dowd's report gave an outline of the record made by all participants in the annual safety contest which closed June 30, 1940.

Data on the Contest

Enrollment in the 1939-1940 Paper Industry Annual Safety Contest set a new high mark. 146 paper and pulp mill units and 29 paper and board remanufacturing plants—a total of 175 contestants, employing 77,128 employees, working 164,620,926 man-hours—reported a total of 2,197 lost-time injuries in the twelve months, July 1, 1939 to June 30, 1940.

Frequency rates of identical contestants averaged 2 per cent above the rates in the 1938-1939 competition. Rates increased 2 per cent in paper and pulp mills and 6 per cent in re-manufacturing plants. Two groups, C and D, consisting of the smaller paper and pulp mills, were successful in improving their rates.

Large mills had the lowest frequency rates, averaging 11.52 in Group A and 13.43 in Group B.

There were ten perfect scores in all; one in Group C, eight in Group D, and one in the Re-Manufacturing Division. The Woronoco Mills of Strathmore Paper Company worked 538,231 man-hours, the greatest exposure of any contestant with a perfect record in this contest.

Improvements in frequency rates over last year were made in each of the first three ranking positions of all paper and pulp mill groups. The Re-Manufacturing Division had but one perfect score, in comparison with three in the previous competition.

Five-year frequency records of contestants in the first three ranking positions of each group in the 1939-1940 Contest, showed marked improvements that many have made in their accident records over this period of time.

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IF YOU could look into your gear cases while the gears are moving, you'd find a situation much like the one above. The convex surfaces of your gear teeth offer but a minute line of contact—and all the power of your engines tries to push them together.

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Call in your Shell man today —let him start insuring a smooth life and a long one for your gears.

SHELL INDUSTRIAL LUBRICANTS

Representatives of some of the contest winners in the paper industry annual safety contest. The group plaques and certificates are awarded annually by the National Safety Council. Reading left to right: Front row—T. A. Spencer, Mead Corp.; Mrs. A. C. L. Fritz, vice president and treasurer of Fritz Publications, Inc., who awarded the Edward Benton Fritz Memorial Trophy which is given each year to the outstanding group winner by that organization; C. E. Higgins, Strathmore Paper Co., who received for his company the Memorial Trophy from Mrs. Fritz; J. Massey, U. S. Gypsum Co.; Back row—H. L. Moore, Mead Corp.; E. L. Hooper, Sylva Paperboard Co.; D. E. Mullen, Kimberly-Clark Corp.; George Adams, International Paper Co.; Russell H. Bentz, P. H. Glatfelter Co.

The second part of Mr. Dowd's report brought out very interesting and detailed information dealing with the records of contest winners in the different groups. The final ranking of all contestants with accompanying data was published in the September, 1940 issue of THE PAPER INDUSTRY AND PAPER WORLD. Following is a list of trophy and certificate winners:

DIVISION ONE

Group A

Price Brothers & Co., Ltd., Kenogami Mills, Quebec, Can. (Trophy).

Anglo-Canadian Pulp & Paper Mills, Ltd., Quebec, Can. (Certificate).

Hollingsworth & Whitney Co., Waterville, Me. (Certificate).

Group B

Hoberg Paper Mills, Inc. (Div. "A"), Green Bay, Wis. (Trophy).

St. Croix Paper Co., Woodland, Me. (Certificate).

P. H. Glatfelter Co., Spring Grove, Pa. (Certificate).

Group C

Strathmore Paper Co., Woronoco, Mass. (Trophy).

Southern Kraft Corp. (Continental Div.), York Haven, Pa. (Certificate).

Escanaba Paper Company, Escanaba, Mich. (Certificate).

Group D

Sylva Paperboard Company, Sylva, N. C. (Trophy).

Spaulding Fibre Co., Inc. (Milton Plant), No. Rochester, N. H. (Trophy).

U. S. Gypsum Co., No. Kansas City, Mo. (Trophy).

International Paper Co., Livermore Falls, Me. (Trophy).

The Mead Corp., Nashville, Tenn. (Trophy).

Hollingsworth & Whitney Co., Madison, Me. (Trophy).

International Paper Co., Riley, Me. (Trophy).

Spaulding Fibre Co., Inc. (Hayes Plant), No. Rochester, N. H. (Trophy).

The Mead Corp., Harriman, Tenn. (Certificate).

Bird & Son, Inc., Phillipsdale, R. I. (Certificate).

DIVISION TWO

Bay West Paper Co., Green Bay, Wis. (Trophy).

Gaylord Container Corp., St. Louis (Certificate).

Kimberly-Clark Corp., Neenah, Wis. (Certificate).

The trophies and certificates awarded to group winners by the National Safety Council were presented to representatives of the winning mills by J. E. Long, a past president of the Council. Mr. Long congratulated each recipient and asked that they take home the best wishes of the Council and the Pulp and Paper Section for a fine performance in the next contest.

The final contest data for each group places mills in such ranking position that the winners are recognized before the meeting is held. However, there is always one big surprise at the luncheon, for no one but the judges knows which of the group winners has been chosen to receive the award of the year—the Edward Benton Fritz Memorial Trophy. After the other trophies and certificates were presented, Chairman Chant asked A. Scott Dowd, president and general manager of Fritz Publications, Inc., Chicago, to make this announcement. Mr. Dowd in turn presented Mrs. Fritz, vice president and treasurer of Fritz Publications. At the Congress in Atlantic City last year, Mrs. Fritz presented for the first time the Edward Benton Fritz Memorial Trophy, which award replaced the Paper Industry trophy that the late Mr. Fritz had awarded for 14 years.

Mrs. Fritz spoke with deep feeling for the progress that had been made

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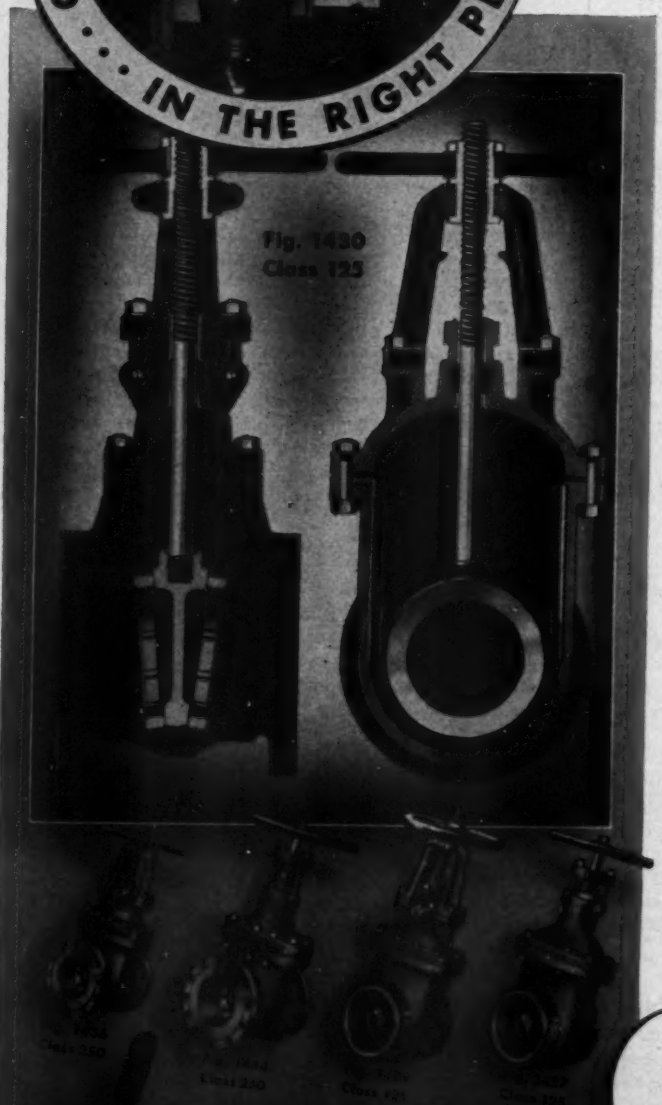

● You don't have to be a valve *specialist* to recognize "engineered superiority" in Lunkenheimer Iron Body Gate Valves. Even a casual observer will immediately be struck by their heavy, rugged construction and the obvious quality of the castings employed. Every detail, even to swing-bolts and built-in gland supports which facilitate repacking, bespeaks meticulous care to design a valve that will save the user time and money over long periods of service.

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HISTORICAL REVIEW
OF THE PAPER INDUSTRY ANNUAL SAFETY CONTEST

Year	No. of Mills	No. of Man-hours	No. of Employees	No. of Reportable Injuries	Frequency Rate	No. of Employees per Injury	Mills with Perfect Records
1939-1940	175	164,620,962	77,128	2,197	13.35	35	10
1938-1939	163	133,034,656	64,178	1,705	12.82	38	12
1937-1938	145	116,896,797	53,622	1,603	13.71	33	7
1936-1937	139	123,611,911	56,470	2,015	16.30	28	7
1935-1936	130	100,491,110	45,915	1,517	15.10	30	14
1934-1935	110	86,867,184	42,378	1,439	16.57	29	12
1933-1934	105	71,436,322	34,132	1,402	19.63	24	6
1932-1933	98	60,772,518	34,709	829	13.64	42	11
1931-1932	131	74,569,954	32,454	1,044	14.00	33	9
1931*	125	48,715,543	39,796	787	15.74	52	15
1930*	124	47,343,549	36,153	986	20.83	37	11
1929*	123	49,776,515	36,916	1,311	26.34	27	6
1928*	122	47,673,816	36,357	1,355	28.42	27	8
1927*	119	43,802,804	33,786	1,468	33.51	23	6

*Contest period January 1, to June 30.

in the contest during the past year. As she put it, the men in the mills were not working for a trophy, but something that would be a symbol of honest safety effort; something to which they might point with pride and the satisfaction that comes from doing their best for the safety of humanity. At the close of her remarks she named as the winner, the Strathmore Paper Company, Woronoco, Massachusetts, and asked C. E. Higgins, who represented the Strathmore Company, to come forward and accept the trophy. Mr. Higgins thanked Mrs. Fritz and on behalf of his company expressed appreciation for the honor they had received. He said the trophy would occupy a prominent place in their plant and he knew it would be a constant inspiration to all who had participated in helping make the record that had won it. Chairman Chant also thanked Mrs. Fritz on behalf of the Section.

The Luncheon Meeting and the Thursday afternoon session brought the Section meetings to a close. After the awards, R. W. Laughlin, safety engineer of the Liberty Mutual Insurance Company, Portland, Maine, presented an interesting and informative demonstration which he called "A Bag of Safety Tricks." This lecture-demonstration was presented in a graphic manner and consisted of illustrations of the right and wrong way to walk and stand, how to avoid slipping and strains, the correct use of various wood handling tools, etc.

Mr. Laughlin's demonstration was followed by a Round Table Discussion of subjects of interest to all safety workers. The first subject to be discussed was "Safety Contests in the Plant."

One member explained how the contest works in his plant. He stated that his company sponsors an interplant contest based somewhat on the same set of rules governing the paper industry contests and that the company gives a trophy every year to that plant which had made the lowest and best safety record. Every three months the company awards a quarterly first place banner and a quarterly second place banner. The speaker brought forth figures to prove the value of safety contests, also explaining the benefits of the safety sweepstakes plan. After several questions and answers as to the specific operation of the contests and sweepstakes, the chairman began discussion of the topic of "Maintaining Plant Tidiness and Good Order."

One member stated that much was accomplished in keeping the plant clean by organizing a contest. The first inspection trip was announced; the second was unannounced. Prizes were football tickets. The members stated that in one case the cleanliness desired was obtained without any additional cost.

After this discussion several samples of safety posters were displayed and a brief discussion on this phase of safety work took place.

Following this discussion, the delegates exchanged good wishes and left for their homes and jobs convinced that *safety does pay.*

◆

Safety Exposition

One of the most interesting and informative features at the entire Safety Congress was the exhibition of safety equipment and supplies.

The exhibition, held in the Hotel Stevens' large exhibition hall, contained displays and booths of over 100 different companies and organizations covering every conceivable sort of apparatus, equipment or supplies pertaining to safety.

Prominent among the many exhibits were those of Bausch & Lomb Optical Company, which had an extensive array of safety goggles and other eye protective devices; the Chicago Eye Shield Company, which displayed head and eye protection equipment; Davis Emergency Equipment Company, which exhibited industrial safety equipment; Fairway Laboratories, which presented salt tablets and dispensers, and the U. S. Hoffman Machinery Corporation, which demonstrated the uses of the company's vacuum cleaning units.

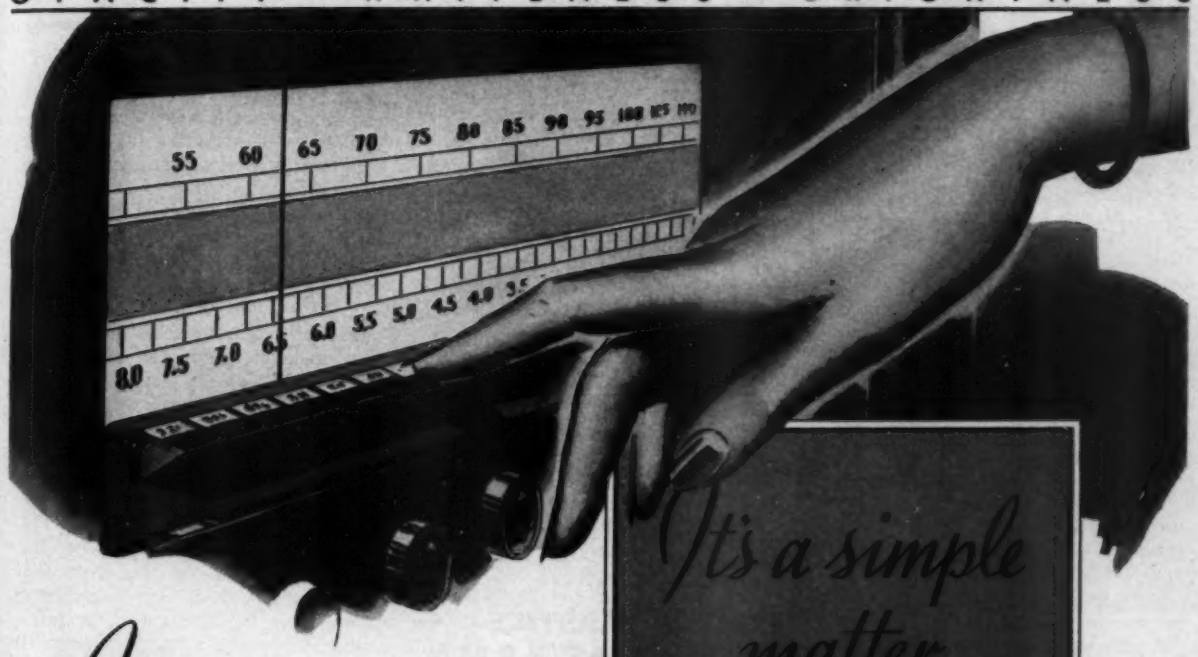
Other displays of note included those of the Shell Oil Company, featuring a drivers' test; Phister Manufacturing Company, fire extinguishers; Pyrene Company, fire extinguishers, tire chains; Rose Manufacturing Company, safety belts and shock absorbers; Chisholm-Moore Hoist Corporation, chains and hoists, Mine Safety Appliances Company, an extensive array of respirators, masks, shields, goggles, etc.

Movies, slides and demonstrations were used to a great extent to illustrate the features of the materials on display.

Fine prizes were also given away. J. F. Berry, of the Alton Boxboard Company, was one of those lucky enough to draw a prize.

The next annual Congress will be held in Chicago at the Stevens Hotel. The dates set are October 6 to 10, 1941.

OPACITY • WHITENESS • BRIGHTNESS



It's a simple matter of SELECTION

WHEN you seek opacity, whiteness and brightness for your catalog, bond, tissue and board stocks, turn to TITANOX and you will find them. Three standard TITANOX pigments now available cover every situation that arises in the manufacturing of white paper products, and give better results in opacity, whiteness and brightness than heretofore have been obtainable.

TITANOX-A (pure titanium dioxide), most opaque of all white pigments, produces these three desirable characteristics with minimum pigmentation. TITANOX-B-30 (titanium barium pigment) as a filler or coating pigment, and TITANOX-C (titanium calcium pigment) for coating, have distinct advantages in opacity over ordinary white pigments. All these TITANOX products are exceptionally white and bright, have uniformly fine particle size, and are chemically inert. Their wide adoption by the paper industry indicates their particular adaptability to paper making processes.

Our Paper Service Department will gladly assist you to obtain the maximum value from TITANOX pigments.

Cooperation. When a doubt appears in your mind regarding the proper TITANOX pigment for a given paper product, communicate with our Paper Service Department. Or if any problem arises in relation to the use of TITANOX pigments under any condition, bring it to headquarters. We are pleased to give full cooperation in technical problems. As the originators of titanum pigments, with a background of twenty years in studying and developing them, we are able to advise you with authority.

TITANOX

TRADE MARK

TITANIUM PIGMENT CORPORATION *Sole Sales Agent*

111 Broadway, New York, N. Y.; 104 South Michigan Ave., Chicago, Illinois; National Lead Co. (Pacific Coast Branch), 2240 24th Street, San Francisco, California

ASSOCIATIONS

MAINE—N. H. TAPPI ORGANIZED

A meeting of technical men of the industry was held at the University of Maine, Orono, Maine, October 25-26, 1940. At this meeting a new section of the Technical Association of the Pulp and Paper Industry was formed. This new section is known as the Maine-New Hampshire Division of TAPPI and it will hold two meetings each year.

The new officers elected to serve this section are as follows: Chairman—W. E. Brawn, Pejepscot Paper Company, Brunswick, Maine; Vice Chairman—T. M. Barry, Fraser Companies, Ltd., Madawaska, Maine; Secretary-treasurer—J. G. L. Caulfield, University of Maine. Chairman Brawn, who was chairman of the Organization Committee, presided at the organization meeting.

A very interesting program and special entertainment features were enjoyed by about 140 who attended the first meeting.

◆

SUPERINTENDENTS OF TWO DIVISIONS MEET IN SAVANNAH

Determination of southern pulp and paper mills to be prepared for any emergency and the fullest co-operation with the National Defense Commission was the keynote of the fall meeting of the Southern and Southeastern Divisions of the American Pulp and Paper Mill Superintendents Association held in Savannah, Georgia, November 1-2. The high point in the joint meeting was stressed by Alan G. Goldsmith, vice president of the Mead Corporation in his address on company policies and labor relations problems with relation to the National Defense Program.

Mr. Goldsmith emphasized the point that in order to keep keyed to a high point of efficiency and be in a position to meet each emergency as it arises, there must be the closest relationship between management and labor. He pointed out that the foreman is the real key to this relationship as he is directly in contact with the laboring man.

Numerous technical papers were read and round table discussions held during the two-day meeting. H. H. Burrows of the Manhattan-Raybestos Inc., read a paper on "Rubber Rolls for Modern Machines"; Dr. Mark W. Bray, of the Forest Products Laboratory, Madison, Wisconsin, spoke on "Hardwoods—A Pulping Opportunity," and Dr. Harry Vaughan, dean of the School of Ceramic Engineering at the Georgia School of Technology, spoke vividly of the place of the technical man in the pulp and paper industry. Sight-seeing trips through old Savannah and to the Herty Memorial Laboratory and the Union Bag and Paper Corporation were enjoyed by many. The ladies enjoyed the tea and bridge parties.

Y. M. Champagne of the Gulf States Paper Corporation was elected chairman of the Southern Division and Allen Muir of the Mead Corporation was elected chairman of the Southeastern Division. About 200 members attended the joint meeting.

◆

RUBBER-PLASTICS SESSIONS AT A.S.M.E.

A series of meetings will be sponsored by the subdivision on rubber and plastics at the annual meeting of the American Society of Mechanical Engineers to be held at the Hotel Astor, New York City, during the week of December 2.

The first session, to be held on December 5, will feature two papers; "Design and Applications of Phenolic Resin Asbestos Compositions in Corrosion Resistant Equipment," by W. H. Adams, Haveg Corporation; and "Rubber Springs-Compression Loading," by J. F. Downie Smith of the United Show Machinery Corporation. Two other papers are "The Creep of Natural and Synthetic Rubber Compounds in Shear," by Ivan Gazdik and S. H. Hahn, of the B. F. Goodrich Company, and "Notes on the Creep of Neoprene in Shear," by F. L. Yerzley of E. I. du Pont de Nemours and Co.

◆

POWER SHOW OPENS DEC. 2

The Fourteenth National Exposition of Power and Mechanical Engineering will be held Monday, December 2 through Saturday, December 7 inclusive. The Exposition will be held at the Grand Central Palace, New York City.

This Exposition, the fourteenth of its kind, is a national market place at which are displayed the newest products of research and invention in power and mechanical engineering equipment. Exhibits at the show are arranged to give the required information in the shortest possible time and engineering specialists, representing the exhibitors, are present for consultation and to give supplementary information.

More than 290 exhibitors are reported for this year's show and a probable 50,000 will attend the show.

Products to be shown at the Exposition include: combustion apparatus, boilers and heaters, refractories and insulation, piping, valves, steam plant apparatus, instruments, transmission apparatus, electrical apparatus, materials handling equipment, air conditioning and refrigerating apparatus, metals, power plant specialties, machines and tools

The Fourteenth National Exposition of Power and Mechanical Engineering is under the management of the International Exposition Company and will be personally supervised by Charles F. Roth.

◆

KALAMAZOO TAPPI HAS FALL MEETING

Fifty members and guests attended the first fall meeting of the Kalamazoo Valley section of the Technical Association of the Pulp and Paper Industry at the Park-American Hotel on October 3. Chairman Kent Kidder of the Bryant Paper Company presided.

Mr. Kidder introduced the new officers and members from various companies after which Frank Libby was named chairman of a committee to study the advisability of investing the group's treasury surplus in a spectrophotometer for the use of the various mills. Paul de Guehery, A. Sherwood and William Hathaway were named to the committee. Merle Wilkens was appointed head of a committee to revise the constitution of the section so that it will no longer call for a September meeting.

As a feature of the meeting J. P. Strasser of the Stein Hall Manufacturing Company, presented a paper on "Starch and Papermaking." Mr. Strasser showed the value of different types of starch, stressed the importance of adding starch on the machine side of the jordans so that its value as a binder would not be destroyed, and declared that the American paper industry would not suffer any loss of starch supply since there is a large supply of domestic starch.

MATHEMATICAL *Accuracy*

Photo, Courtesy The Champion Paper & Fibre Co.

THE ROLLS, bearings and bushings of a paper machine must be mathematically accurate in order to maintain uniformity of output. Periodical regrinding of rolls and readjustment of bearings is necessary to correct uneven wear and faulty alignment.

The wear and tear on a woolen felt is much greater than that of the metal parts. It cannot be corrected by mechanical treatment. The felt must be uniform in thickness, weave and texture when it goes on the machine. It must wear evenly until it is worn out.

Because Hamilton Felts are woven with special reference to the machines on which they are to operate . . . because they are made of the finest and strongest fleeces . . . because they are mathematically uniform, seamless and pre-shrunk . . . Hamilton Felts require no shut-downs for adjustment. They wear evenly, last longer and cost less.

From the thinnest tissue to the heaviest board, there is a Hamilton Felt that will do your work better, faster and at lower cost.

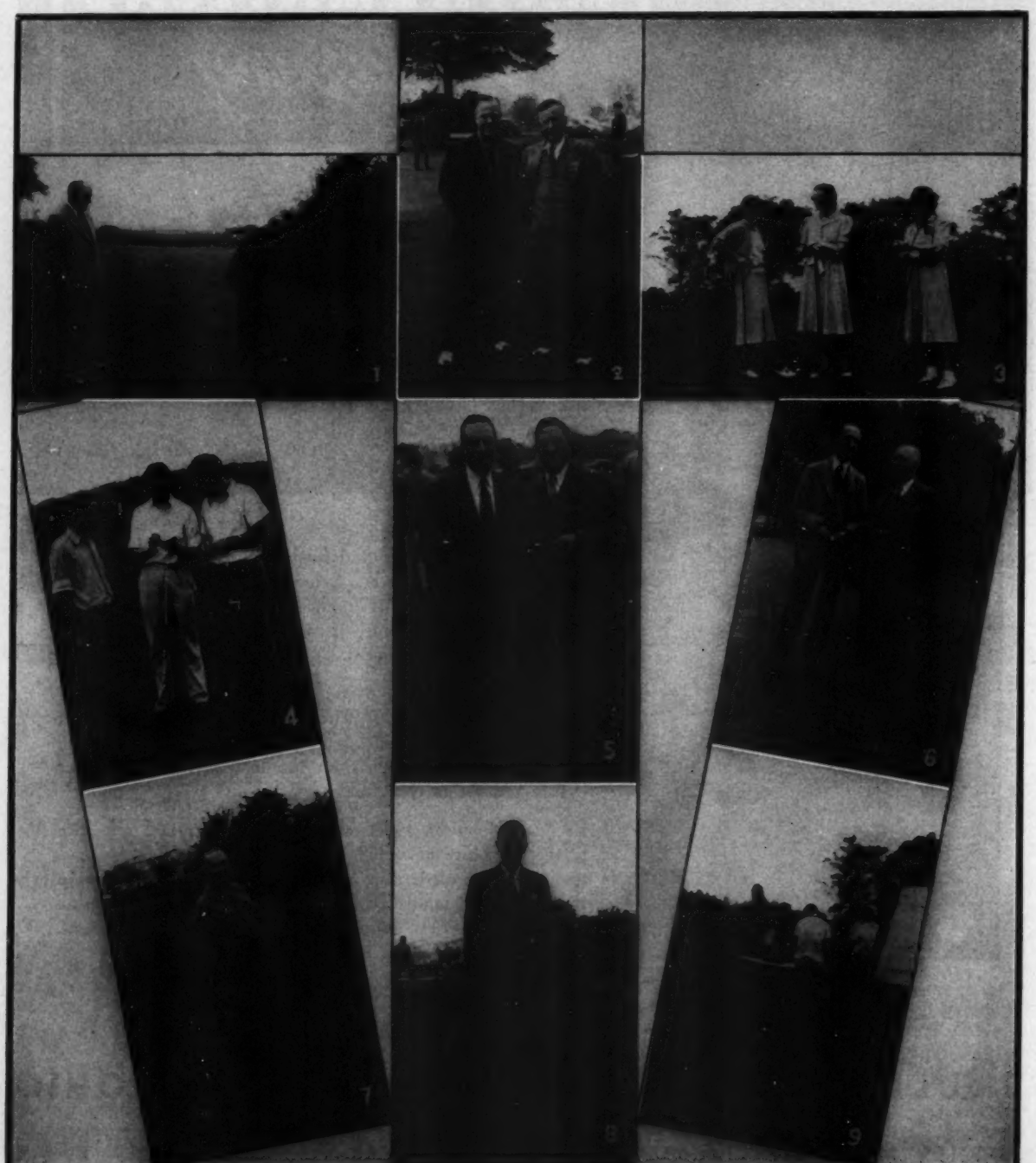
SHULER & BENNINGHOFEN, HAMILTON, OHIO

Miami Woolen Mills

Hamilton Felts

Established 1858

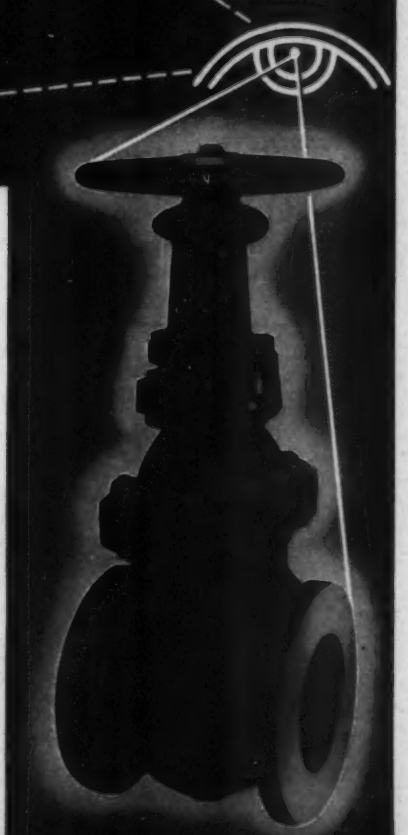
Superintendents Work and Play at Poland Springs Meeting



1—David Blanchard (left) and L. L. Smith, both of Magnus Chemical Co., near the ninth hole. . . . 2—Cyril Lever (left), C. Lever & Co., and M. F. McCarthy, Hollingsworth & Whitney Co., are persuaded to stop for a minute. . . . 3—The ladies played, too, and these three look well pleased with their game. (L to R)—Mrs. Geo. H. Batcheldor (Staley Sales); Mrs. Geo. Carroll (Monadnock Paper Mill); and Mrs. W. J. Sullivan (Du Pont). . . . 4—What's the score? C. E. Center ("That's right, you're wrong"—anyway he's in the middle) tells E. B. Ackerman (left), a fellow worker from Westinghouse, and A. H. Stanton, of Mason-Neilan, that so far it looks OK. . . . 5—After the game, David Milne (left) and A. H. Holbrook, of English China Clays Sales Co., are in the best of spirits. . . . 6—What a scoop for the photographer, to find two such important men in the Association close enough to get them both with one shot. Left—A. B. C. Drew, national president of the Superintendents Association. Right—G. W. Craigie, the Association's field secretary. . . . 7—J. H. Loomis, of Heller & Merz, won salesmen's low net in the golf tournament. . . . 8—The cameraman picked up another good shot in this one of K. E. Terry, of S. D. Warren Co. Mr. Terry was general chairman of the meeting. . . . 9—Ivar Eckholm discovers a camera is pointed in his direction.

There's more to POWELL QUALITY

than meets the BUYER'S EYE!



BEHIND ALL OUR VALVES...

are these mechanical wizards constantly checking metals for physical improvements

There's nothing the least bit magical about the strength and durability of metals used in all Powell valves. Day in and day out, new alloys are being developed, but, long before they take the familiar shape of our finished product, they're subjected to every possible test to predetermine their physical qualifications for the jobs you have in store for them.

Shown above are tension, compression, hardness, and impact testing machines . . . right in our own laboratory where our own trained metallurgists can give us first hand reports on the physical characteristics of any metal tested. It's more of that "inherent quality" which exists in all Powell valves . . . the kind of quality you buyers usually have to take for granted when you look at a finished product.

Won't you think twice, therefore, when you come to make your next valve purchase? Once about what you see . . . and once about what you don't. On both counts, Powell valves have earned their recognition as the "accepted standard throughout industry."

You Need More Than a Photograph of the Finished Product to See ALL the Qualities that Make Powell Valves Uniquely Able to Better Serve the Mill Owner.

THE WM. POWELL COMPANY
CINCINNATI, OHIO

POWELL VALVES

Whether it is a new installation, a relining or a repair job, it takes specialized experience to produce a job that is dependable and economical for a number of years.

Again and again Semco relinings prove quality is real economy.

Stebbins Engineering and Manufacturing Co.

Eastern Boulevard - Watertown, N. Y.

SURVEY SHOWS INTEREST IN PACKAGING

The extent to which various consumer goods industries are concerned with the packaging problems is reflected in an analysis just completed by the management of the Packaging Exposition of 1941, to be held in Chicago in April under sponsorship of the American Management Association.

The study was based on an occupational analysis of more than 10,000 registrants at the last exposition and breaks down by industries, the attendance at the show.

Food industries take the lead with 14.8 per cent of the total classifiable visitor list with drugs and cosmetics a close second, the latter having 13.4 per cent. Third and fourth place was taken by dry goods and textiles and confectionery, respectively.

It was announced by the exposition management that with the opening date of the Exposition still five months away, almost 90 per cent of the available space had been leased. The Packaging Exhibition will be held April 1-4 at the Stevens Hotel, Chicago.

CONVENTIONS AND COMING EVENTS

Nov. 12-13 — American Management Association, Production Division, Autumn Conference, Cleveland, Ohio.

Nov. 13-14—Purchasing Agents Association of Chicago, Annual Products Exposition, Hotel Sherman, Chicago.

Nov. 15—Joint Meeting, American Section of the Society of Chemical Industry with the American Institute of Chemical Engineers, The Chemist's Club, New York City.

Dec. 2-5—American Society of Mechanical Engineers, Annual Meeting, Hotel Astor, New York City.

Dec. 2-4—American Institute of Chemical Engineers, New Orleans, La.

Dec. 2-7—Fourteenth National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York City.

Dec. 9-13—National Association of Manufacturers, Annual Meeting, New York City.

Dec. 11-15—National Chemical Exposition, Stevens Hotel, Chicago.

April 1-4—Eleventh Packaging Exposition and Conference, Stevens Hotel, Chicago.

April 7-11—American Chemical Society, St. Louis, Mo.

The Paper Industry Safety Contest

July 1, 1940 to June 30, 1941

Out of 189 mills reporting for September, 40 have perfect record

PERFECT SCORES

Division I—Pulp and Paper Mills

PARTICIPANT	MILL	LOCATION
GROUP A		
The Mead Corporation	Chillicothe	Ohio
Anglo-Canadian Pulp & Paper Mills, Ltd.	Quebec City, P. Q.	Canada
Consolidated Paper Corp., Ltd.	Port Alfred, P. Q.	Canada
The Flintkote Company	Pioneer Div.	Los Angeles, Calif.
GROUP B		
P. H. Glatfelter Co.	Spring Grove	Pennsylvania
The Mead Corporation	Rexad Div.	Lynchburg, Va.
Fraser Paper, Ltd.	Madawaska	Maine
GROUP C		
Southern Kraft Corp.	Continental Div.	York Haven, Pa.
Escanaba Paper Co.	Escanaba	Michigan
Donohue Brothers, Ltd.	La Malbaie, P. Q.	Canada
Strathmore Paper Co.	West Springfield	Massachusetts
Price Brothers & Co., Ltd.	Jonquiere, P. Q.	Canada
Strathmore Paper Co.	Woronoco	Massachusetts
Finch, Pruyn & Co., Inc.	Glens Falls	New York
**Cornell Wood Products Co.	Cornell	Wisconsin
The Mead Corporation	Harriman Co.	Harriman, Tenn.
*Rising Paper Company	Housatonic	Massachusetts
GROUP D		
American Writing Paper Corp.	Parsons Div.	Holyoke, Mass.
Bird & Son, Inc.	Phillipsdale	Rhode Island
Ealeock Manufacturing Co.	Turners Falls	Massachusetts
American Asphalt Roof Corp.	East St. Louis	Illinois
U. S. Gypsum Co.	North Kansas City	Missouri
Spaulding Fibre Co., Inc.	Milton	New Hampshire
American Writing Paper Corp.	Mt. Tom Div.	Holyoke, Mass.
International Paper Co.	Livermore No. 11	Livermore Falls, Me.
Rogers Fibre Co.	Fibreboard Mill—Div. 1	Bar Mills, Me.
The Mead Corporation	Nashville	Tennessee
Central Fibre Products Co.	Mt. Carmel	Illinois
Hollingsworth & Whitney Co.	Abenaquis	Madison, Me.
Alton Boxboard Co.	Lafayette	Indiana
Central Fibre Products Co.	Vincennes	Indiana
Spaulding Fibre Co., Inc.	Hayes	New Hampshire
Division II—Paper and Board Re-Manufacturing		
Gaylord Container Corp.	St. Louis Container	St. Louis, Mo.
Barber Asphalt Corp.	Madison	Illinois
Bird & Son, Inc.	Chicago	Illinois
Container Corp. of America	Anderson	Indiana
Gaylord Container Corp.	Dallas	Texas
Bird & Son, Inc.	Shreveport	Louisiana
Gaylord Container Corp.	Houston	Texas
Bay West Paper Co.	Green Bay	Wisconsin

*September report missing—covers two months only. **September report missing—report incomplete.

SUMMARY OF CONTEST EXPERIENCE

Division	Man-Hours Worked	Reportable Injuries	Frequency Rate 1940-41 (3 mos.)	Change from July-Sept., 1940
All Divisions	47,407,394	700	14.77	+15 per cent
Paper & Pulp	43,982,011	639	14.87	+15 per cent
Group A	29,639,744	372	12.55	+28 per cent
Group B	6,941,670	128	18.44	0 per cent
Group C	4,443,179	96	21.61	+23 per cent
Group D	1,957,418	43	21.97	—10 per cent
Paper & Board Re-Manufacturing	4,425,283	61	13.78	+11 per cent

"every paper mill should consider its merits"

...e Exact-a-Load installed

The advantages of this device as compared with the old fashioned method are many, but we will mention a few of the outstanding improvements.

First The convenience to the operator in knowing at all times just what load he has on the press which can be observed by reference to the chart.

Second Any difference in pressure on front and back can be adjusted at once which, of course, is a saving in paper.

Third The life of the felt is increased by this method of loading.

Fourth More uniform moisture is obtained at the dry end.

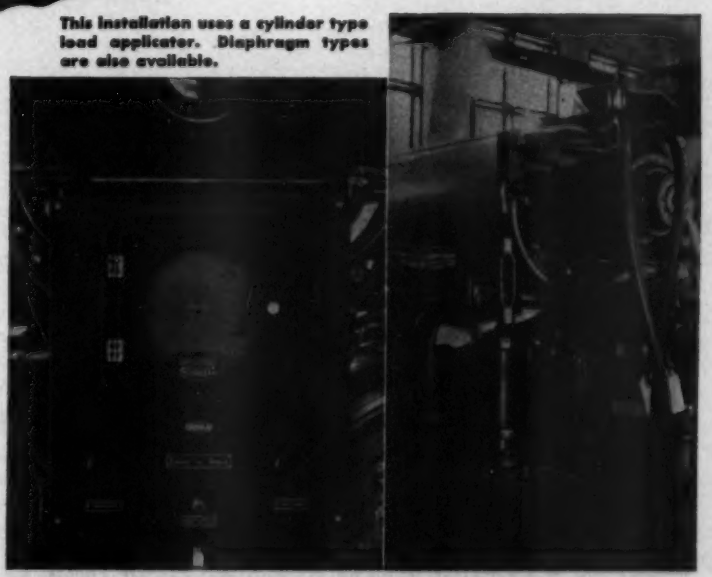
Fifth Saving in felts when crushes occur, as we are able to unload both sides at once, whereas under the old method using weights the unloading takes time and the felt is usually torn before unloading is completed.

In closing we might add that the Exact-a-Load is saving the company money every day and we believe every paper mill should consider its merits.

Very truly yours

Write today for Bulletin PD-102

This installation uses a cylinder type load applicator. Diaphragm types are also available.



If you are not yet taking advantage of the economies and convenience of this modern method of roll loading, we suggest that you investigate Exact-a-Load immediately. Bulletin No. PD-102 will be sent promptly on request.

MASONEILAN
REG. U.S. PAT. OFF.

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1196 ADAMS STREET, BOSTON, MASS. U.S.A.

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ALLIED

ARMCO PLANS A $5,000,000 IMPROVEMENT

A $5,000,000 plant improvement program designed to effect operating economies and increase production is to be undertaken by the American Rolling Mill Company, Middletown, Ohio.

The program includes a new cold reduction plant at the Middletown division, estimated to cost $3,800,000 including equipment and 25 by-product ovens and other improvements at the Hamilton (Ohio) plant, costing $1,500,000.

Construction of the cold reduction plant will begin at once. Contractors estimated it would be ready in eight or ten months.

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▸▸▸ THE MERGER OF the National Oil Products Company's laundry division with Division H of the company, has been announced. Marvin S. Eavenson, formerly with Colgate-Palmolive-Peet, is in charge of the new division.

◆

▸▸▸ GENERAL ELECTRIC EMPLOYEES who are called for military service or those who voluntarily enlist for the 12-month training period, will receive a full month's pay and be granted a year's leave of absence, it was announced recently. Only employees with one year or more of continuous employment with the company will be eligible to receive this adjustment. Employees will be restored to former positions or positions of like seniority, status and pay at the expiration of military service unless circumstances make it impossible or unreasonable to do so.

◆

WHEELER ROLL COMPANY EXPANDS

A building expansion program that will double its present manufacturing space was announced recently by the Wheeler Roll Company, Kalamazoo, Michigan. The Wheeler company, established only last June for the manufacture and repair of paper mill calender rolls, will construct a cement and steel building on the west side of the plant.

The new building, which will consist of one floor and basement, will bring the total floor space to about 6,000 square feet. Five large hydraulic presses are among the present equipment and eight more will be provided for in the new building, according to Ward O. Wheeler, one of the three partners in the business.

The company now manufactures new rolls and re-fills old ones for mills throughout the United States and Canada. Other partners in the business are Grant A. Wheeler, a brother, and Frank Wheeler, of Appleton, Wisconsin, father of Messrs. Ward and Grant Wheeler.

◆

JOHNSTONE NOW IN DOWNINGTOWN

The Johnstone Engineering and Machine Company, formerly of Newark, New Jersey, is now located in Downingtown, Pennsylvania. The Johnstone company builds a complete line of slitters and winders and a uniform tension unwind stand and is headed by Robert McC. Johnstone, founder of the organization. The line of machinery was all designed in 1940 combining Mr. Johnstone's twenty years' experience in the field with modern engineering practice.

◆

▸▸▸ DIRECTORS AND OFFICERS elected at the annual meeting of White Valley Chemicals, Ltd., include J. M. Firth, president and J. R. L. Starr, vice president. The company is engaged in mining calcium carbonate near Bobacaygeon, Ontario. Paper manufacturers are important purchasers, it was revealed.

◆

HEWITT HOLDS "OPEN HOUSE"

In celebration of the completion of a plant wide expansion and improvement program, the Hewitt Rubber Corporation, Buffalo, New York, held open house on September 28 for its employees and their families. The occasion was marked by the presentation of service pins to fifty-four factory and office workers, bringing to 224 the number of employees who have thus received recognition for length of service.

Formal dedication of the new building was made by Thomas Robins, Jr., president, with the unveiling of a bronze plaque on the second floor designating the name of the new building as the "Twombly Building" in honor of Earl K. Twombly, vice president in charge of manufacturing. In addition to the presentations and dedication, the program included refreshments, conducted tours of the plant, and the awarding of door prizes.

Hewitt's new building is three stories high, modern in design and of brick fire-proof construction. All raw materials such as oils, pigments, and accelerators are stored in automatic dispensing bins and tanks and automatic weighing equipment checks each batch before it enters the mixers. Scientifically accurate controls have been established over all of the primary manufacturing processes.

◆

▸▸▸ INDUSTRY'S PART in the management of business connected with matters pertaining to National Defense is being covered in a series of articles in the Elliott Service Company's weekly foremanship bulletin *Management Information.* This series is entitled "How to Train Men Quickly," and the Elliott Service Company feels that these articles will be of great value in a program of intensive short-term job training.

◆

STORY BACK OF THE ASTEN-HILL TRADEMARK

One of the most novel company publications that has yet come to the attention of the magazine's editorial staff has been released by the Asten-Hill Manufacturing Company, Philadelphia.

The publication, unique both as to content and appearance, tells the story of "Yang-Yin," the Chinese symbol adopted for the Asten-Hill dryer felt trademark. This story is amazing, almost incredible. The Asten-Hill symbol, it is revealed, is a very old Chinese symbol of eternity and protection against misfortune. The Asten-Hill company suspected some time ago, quite by accident the symbol was of far greater importance in world history than was imagined. To unravel the riddle, countless hours were spent in poring over 100 volumes, many of them rare and valuable, in public and private libraries, Art treasures, relics and antiques of ancient China were examined. The result is the story of "Yang-Yin."

That story, of course, cannot be told in this limited space but it can be said that the origin of the symbol lies buried in antiquity and that it was then, as it is now, the symbol of the fundamental principle of the life of the Chinese race. Symbolically, "Yang", representing the light portion of the Asten-Hill circle, is the positive, masculine principle, while "Yin," representing the dark half of the circle is the negative, female or material principle. Thus, says the record, the circle, locked together with

EXPERT FABRICATION
BRINGS MAXIMUM SAVINGS
TO *Pittsburgh Piping* CUSTOMERS

Exhaust Header, Drain Cooler and Miscellaneous Piping Prefabricated and Erected by PITTSBURGH PIPING

By having your piping system pre-fabricated in Pittsburgh Piping shops you obtain the many benefits fundamental to this type of procedure. Here bending, welding, machining and heat treating can be done accurately and with maximum efficiency. Not only is considerable time saved by pre-fabricating units as large as shipping and erection facilities permit, but all operations can be thoroughly checked and work cleaned and inspected before shipping.

But savings for our customers do not stop here. When each installation has been detailed by the engineering department, all units are scheduled through the shop in direct relation to the sequence of their erection in the field. Work progresses smoothly and efficiently; expensive waiting periods for material are eliminated, and installation is completed more rapidly and according to a pre-arranged construction program.

Pittsburgh Piping is thoroughly familiar with problems peculiar to the paper industry and is equipped to fabricate and erect complete power and process systems, including stainless steel lines, to your specifications.

PITTSBURGH PIPING & EQUIPMENT CO., 10 FORTY-THIRD ST., PITTSBURGH, PA.

Woolworth Building, New York · Occidental Building, Indianapolis · Peoples Gas Building, Chicago · Union Guardian Building, Detroit
Public Square Building, Cleveland · Liberty Life Building, Charlotte · 10 High Street, Boston · 525 Market Street, San Francisco

"Yang" and "Yin," carrying within it the essence of each other and each shaped to each other, symbolizes the Chinese ultimate principle—"Yang-Yin" forever united, forever opposed, the antithesis of all things.

Aside from this story the Asten-Hill publication deserves commendation because of its physical appearance. It is arranged, printed and bound in a form simulating the Chinese style of bookmaking. The cover paper is imported hand made paper. The inside pages are printed on only one side of a single folded sheet, just as are books in China. The arrangement of sewing together the covers and inside pages is similar to that found in ancient Chinese books and one must read from back to front instead of in the typical Western manner! It is an intensely interesting publication and its compilers deserve much praise for their efforts.

◆

NEW SUBJECT FOR IPI ESSAY CONTEST

"Printing—the Safeguard of Democracy," is the new subject for the IPI Essay Contest, sponsored for four years in co-operation with the National Graphic Arts Education Association.

More prizes than ever before will be distributed this year among the winning students first prize being a $300 scholarship to the Department of Printing at the Carnegie Institute of Technology. About 7,400 students, representing 312 schools participated in last year's contest which, like this year's event, is jointly sponsored by the International Printing Ink Company and the Graphic Arts Education Association.

◆

▶▶▶ A NEW ADDITION to the Rollway Bearing Company, Inc., plant at Syracuse, New York, is now under construction. The new building will be devoted to bearing assembly and shipping facilities and was erected to provide more capacity for expanding business from the company's regular sources and national defense orders.

◆

SAN FRANCISCO BRANCH OPENED BY CUTLER-HAMMER

The opening of a new factory, warehouse and sales office in San Francisco, California, was announced recently by Cutler-Hammer, Inc., Milwaukee, Wisconsin, manufacturers of motor control, safety switches and allied electrical equipment.

The new plant is a modern, one-story structure with every facility for efficient fabrication and production of switch boards, panel boards, etc. The building also includes a large warehouse with complete facilities for handling and stocking the company's line of electric control apparatus. The Pacific coast sales headquarters of Cutler-Hammer will also be located in the new building. F. H. Oberschmidt, manager of the San Francisco office, supervises the Seattle and Portland sales offices as well. The new headquarters are located at 711 Potrero Avenue.

◆

GRAPHIC ARTS EXHIBIT AT CHICAGO MUSEUM

An educational exhibit in the field of graphic arts is now included among the many other similar displays at Chicago's Museum of Science and Industry.

The exhibition, covering some 15,000 square feet, tells a simple, clear story of the fundamental principles of printing and its allied arts. Color, animation, modern printing equipment in full operation and lecture-demonstrations will be employed at the exhibition together with comprehensive exhibits of the various phases of printing.

This permanent feature is the result of the co-operation of a large number of the leading printing machinery and equipment manufacturers, trade associations, printers, lithographers and others interested in the welfare of the industry.

◆

▶▶▶ A NEW TRADE-MARK is to appear on all gauges manufactured by the Ashcroft Gauge Division of Manning Maxwell and Moore, Inc., Bridgeport, Connecticut. The shield outline, so familiar to Ashcroft gauge users, is to be retained but the date "1850" is shown on the shield together with the letters "U. S. A."

◆

DOUBLE SIZE OF TWO du PONT POWDER PLANTS

The smokeless powder plant now being constructed by E. I. du Pont de Nemours and Company at Charlestown, Indiana, for the government, will be twice the size originally planned, a government report stated. The War Department has let a contract involving the expenditure of $26,000,000 for additional facilities.

News was also received that the $24,800,000 munitions plant at Wilmington, Illinois, to be operated by du Pont, is also to be enlarged and expanded. It was said that negotiations are now in progress to increase the size of the plant and that about $11,060,000 will be spent for high explosives to be manufactured by du Pont.

◆

▶▶▶ PLANS FOR THE Glyco Products Company's new building in Brooklyn, New York, have been approved and operations are scheduled to begin on or about December 15. The building will consist of three sections; administrative, research and manufacturing and new manufacturing equipment and laboratory machinery is to be installed.

◆

▶▶▶ MANHATTAN RUBBER MANUFACTURING Division of Raybestos-Manhattan, Inc., has announced that Condor whipcord endless belts are now available from stock for prompt shipment in a number of sizes and two styles. The two styles are capable of handling drives from ¼ to 25 horsepower and are applicable to more than 1,500 different drives, it was reported.

◆

COMPETITION FOR PACKAGES IS NOW OPEN

The Annual All-America Package Competition is taking form to reflect the past year's latest and most ingenious developments in the creation of new packages, new displays and new machinery installations. The competition, held under the auspices of *Modern Packaging*, is open to all designers, package suppliers, machinery manufacturers, package-using firms and others responsible for the creation of the package or display. The current competition closes January 6, 1941. Major winners will be announced in the March, 1941, issue of *Modern Packaging*.

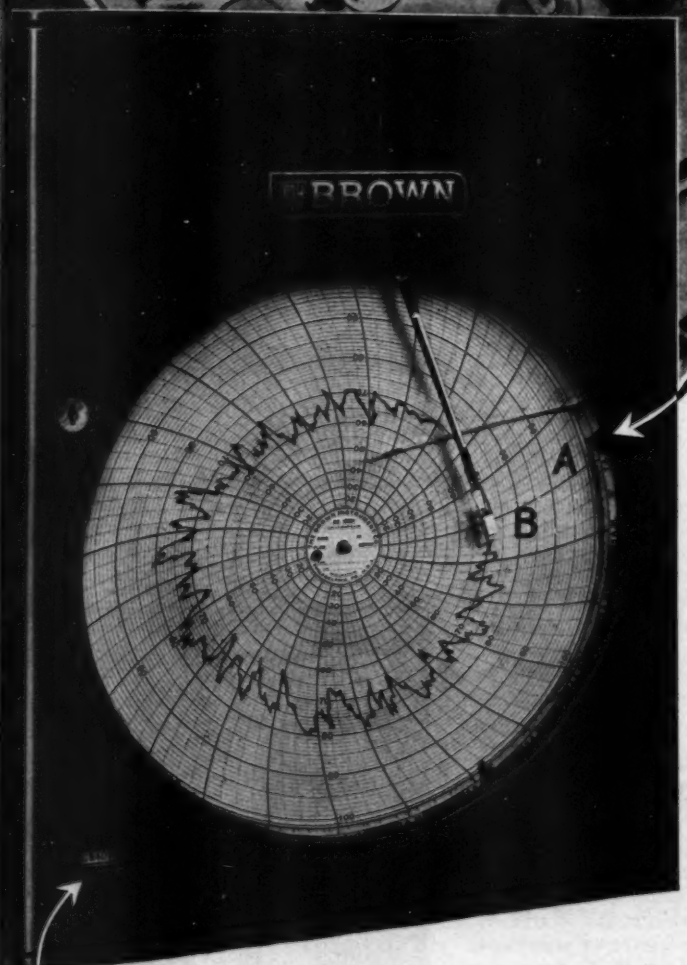
◆

▶▶▶ IN ORDER TO PROVIDE additional space for storage and expanding manufacturing facilities, Raybestos-Manhattan, Inc., has purchased the Brighton Mills plant adjacent to the main plant of the Manhattan Rubber Manufacturing Division at Passaic, New Jersey. The property includes about five and one-half acres on which are buildings with 240,000 square feet of floor space. It is situated on the Delaware, Lackawanna and Western Railroad.

◆

▶▶▶ ANNOUNCEMENT IS MADE by Frederick Wierk that he has sold his interest in Johnson & Wierk, Inc., New York City, and he is now serving as chief engineer for the George A. Fuller Company and the Merritt-Chapman & Scott Corp., contractors for the U. S. Naval Air Base at Quonset Point, R. I., where he is in charge of design.

TOTALS FLOW AS A CASH REGISTER TOTALS DOLLARS



06408

"A"—This automatic planimeter pen record shows steam flow in volume units and the time at which it was produced or used in any part of the 24 hour period, enabling you to easily analyze steam production and distribution.

"B"—This record line shows rate of flow and enables the operators to maintain the most efficient boiler operation, thus effecting substantial fuel savings.

Steam IS money. Wasting steam boosts overhead—eats up income—shrinks profits. Steam accounting is serious business—it needs business methods.

As a modern cash register guards a storekeeper's dollars—producing a printed record of each transaction—so flow meters should guard your power and process steam.

With Brown Flow Meters measuring the flow of fluids for power, heating and processing, you are completely protected—because

The Brown Automatic Recording Planimeter Pen, "A", making the marginal record shown on the chart pictured supplies the PROOF that a definite number of pounds of steam, gallons of water, cubic feet of gas, or barrels of oil, were delivered, utilized—or wasted.

This is a special, patented feature of the greatest value to flow meter users. Reference to the automatic planimeter pen record on chart rim assists you to distribute departmental or process loads more uniformly over the working day, effecting substantial fuel savings not only in the boiler room but in every department or unit where steam is used.

In addition, Brown Flow Meters offer you other advantages such as:

- Six inter-related range tubes with inter-related direct reading charts.
- Meter Bodies for working pressures up to 2500 lbs.
- Integrator dial—easy to read—insures highly accurate totalizing at all rates of flow from 0—100%.
- Universal case permits any style panel mounting—flush on panel, front-of-board or on wall.
- Indicating, Recording and Controlling models—Electrical, Mechanical and Area types for all applications.

Get all the facts about Brown Flow Meters. Features are fully explained in Catalog No. 2007. Send for your copy. THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Co., 4489 Wayne Avenue, Philadelphia, Pa. Offices in all principal cities. Toronto, Canada: 117 Peter Street—Amsterdam-C, Holland: Wijdesteeg 4—England: Wadsworth Road, Perivale, Middlesex—Stockholm, 16, Sweden: Nybrokajen 7.

BROWN Flow Meters

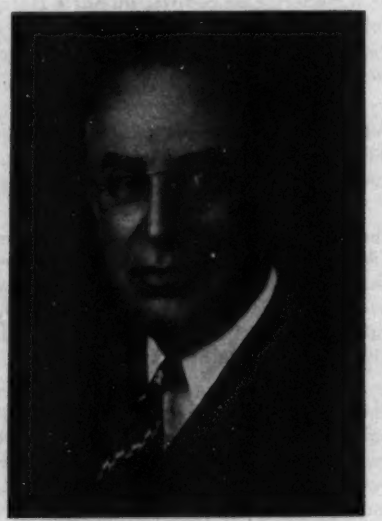
Accurate Measurement with Simplicity

NAMES *in the* NEWS

Personals

NORMAN WILSON IS NEW PRES. OF HAMMERMILL

Succeeding the late Ernst R. Behrend (cf. THE PAPER INDUSTRY AND PAPER WORLD, p. 709, Oct., 1940)



Norman W. Wilson

as president of the Hammermill Paper Company, Erie, Pennsylvania, is Norman W. Wilson, who has been first vice president and general manager of Hammermill since 1929. Announcement of Mr. Wilson's election was made by Dr. Otto F. Behrend, treasurer and one of the founders of Hammermill.

The new president of the Hammermill Paper Company started with the company as an office boy when he was sixteen and has been with the Erie paper firm for thirty-nine years. In 1914 he was named sales manager and vice president and in 1919 he became assistant general manager. Mr. Wilson is president of the Grays Harbor Pulp and Paper Company at Hoquiam, Washington, and is a member of the board of directors of the United States Envelope Company. He is a past president of the Writing Paper Manufacturers Association and a former president of the American Paper and Pulp Association. He is now vice president and a regional director of the A. P. P. A. and a director of the United States Pulp Producers Association.

Donald S. Leslie, who has been a vice president and assistant general manager of the company, was named first vice president to succeed Mr. Wilson. Mr. Leslie, who continues in his post as assistant general manager, has been with Hammermill for twelve years and is a member of the board of directors of Grays Harbor Pulp and Paper Company.

D. S. Leslie

◆

▶▶▶ *Mr. James Logie,* formerly connected with E. B. Eddy Company as sales manager, and *Mrs. Logie,* recently celebrated their golden wedding anniversary in Toronto. Mr. Logie, born in Scotland, came to Canada in 1889 and served with the Canadian Paperboard Company for eighteen years, with Barber-Ellis, Ltd., for five years and later with the Beaver Fibre Company. He had been connected with the E. B. Eddy Company for twenty years.

◆

PENN SALT CO. PROMOTES TWO

At the recent annual meeting of the board of directors of the Pennsylvania Salt Manufacturing Company, Philadelphia, L. A. Smith was elected vice president and treasurer and Warner R. Over was elected secretary and assistant treasurer. Leonard T. Beale was re-elected president of the firm.

Mr. Smith is well known in the chemical and financial circles and came to the Penn Salt organization in 1896. He became secretary and treasurer since 1921. Mr. Over was formerly assistant secretary and assistant treasurer.

HORRELL NOW V.P. OF BLAW-KNOX

S. J. Horrell has been appointed vice president of the Power Piping Division of Blaw-Knox Company, it was announced lately. Mr. Horrell became associated with the company in May, 1939, and has been serving in the capacity of sales manager.

It was also announced that Harry

S. J. Horrell

Gay has been engaged by the company as chief engineer of the Power Piping Division. Mr. Gay was formerly associated with Stone and Webster, Sargent and Lundy and other engineering firms and became well known as principal assistant to the late

Harry Gay

Proved AT THE GREAT LAKES PAPER COMPANY THE NEW TIMKEN BEARING APPLICATION FOR DRYER ROLLS

Some of the new TIMKEN Bearing dryer roll applications at the Great Lakes Paper Company.

Close-up of one of the new dryer roll mountings.

After a year-and-a-half of amazing performance in the 304" mill at the Great Lakes Paper Company following exhaustive laboratory tests, this revolutionary advancement is ready for any dryer roll job; the tougher it is the more convincing will be the results.

Wherever the new mounting is applied, dryer roll bearing troubles will disappear, for roll expansion and deflection now are positively and permanently provided for by a simple principle that *eliminates all lateral movement within the bearing housing*—no sliding of bearing parts.

Briefly, the mounting comprises a self-contained bearing housing supported upon two laminated springs, the lower ends of which are rigidly fastened to a base bolted to the frame of the dryer. All lateral movement of the dryer roll under expansion is absorbed by the springs. Roll alignment is strictly maintained under all operating conditions.

Are you having trouble due to inadequate provision for roll expansion? Change over to this new TIMKEN Bearing mounting and watch your maintenance cost slump. Write for further information.

Tapered Roller TIMKEN BEARING EQUIPPED

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.

TIMKEN
TAPERED ROLLER BEARINGS

V. D. Simons, widely recognized authority in the field of paper and pulp economics and in the production and process engineering of paper and pulp.

◆

▶▶▶ Now chief engineer on sales and development work at the Sandy Hill Iron & Brass Works, Hudson Falls, New York, is *Warren A. Chilson,* for-

W. A. Chilson

merly consulting engineer and assistant sales service manager for the Hooker Electrochemical Company. Mr. Chilson will make his home in Hudson Falls.

◆

PERSONNEL CHANGE AT UNION BAG

Several changes in personnel were announced recently by the Union Bag and Paper Corporation.

L. J. Doyle, who has served as general sales manager since 1934, has been promoted to the position of general production manager, while G. B. Gibson, sales manager of the board and pulp department, has been chosen to succeed Mr. Doyle. Norman Beardsley, previously assistant to Mr. Gibson, succeeds the latter.

◆

A. S. OTTON NOW ADV. MGR. ROBINS CONVEY. BELT CO.

Alfred S. Otton, associated with the Robins Conveying Belt Company since 1937, is now advertising manager of that company, according to a recent announcement by H. Von Thaden, vice president and sales manager. Mr. Otton will be assisted in his new duties by E. E. Riches and John M. Lupton.

Mr. Otton was formerly associated with the late William L. Fewsmith, who for many years was the company's director of advertising and publicity. Mr. Riches has been connected with both the engineering and preliminary design department and Mr. Lupton comes to the company with a wide background of experience in advertising and printing.

The Robins Conveying Belt Company moved its general offices from New York City last May and they are now located in the new administration building at Passaic, New Jersey, where for many years the factories have been located.

◆

▶▶▶ Now in charge of Bulkley Dunton and Company's new export branch is *George G. Cobean,* formerly vice president of Butler Paper Company, Chicago. The new branch, operated as a separate company under the name Bulkley Dunton Export Company, is headed by Mr. Cobean, who is a former president of the National Paper Trade Association.

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▶▶▶ *A. A. Scott,* formerly of the Anglo-Canadian Pulp and Paper Company, is secretary of the Pulp and Paper Research Institute, at Montreal, Quebec.

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▶▶▶ Formerly sulphite superintendent of the Lake St. John Pulp and Paper Company, *J. E. O'Connell* is now sulphite superintendent of the Kenogami (Quebec) plant of Price Brothers and Company.

◆

HAERING CO. ADDS TO ITS PERSONNEL

The addition of a number of chemists and engineers to the staff of D. W. Haering and Company, Inc., Chicago, Illinois, was announced recently.

George Thompson, formerly at the Chicago laboratory was promoted to manage the increasing activities of the New York laboratory; Douglas M. Considine, chemical engineer, was added to the staff of the Chicago laboratory and is engaged in research, and O. R. Borngesser has been placed in the company's Wichita laboratory. Two engineers, J. R. Lindley and D. R. Walser, have been placed in the Chicago sales organization. F. H. Wright of the Chicago staff was promoted to manager of the Chicago district service department.

These additions and promotions were necessitated by expansion of the Haering company's laboratory facilities and the initiation of an extended research program.

PERSONNEL CHANGES AT ST. JOE PAPER CO.

Since the withdrawal of the Mead Corporation's interest in the St. Joe Paper Company, Port St. Joe, Florida (cf. THE PAPER INDUSTRY AND PAPER WORLD, p. 218, June, 1940), certain changes in personnel have been effected. The Mead Corporation, which had owned fifty per cent of the company relinquished the ownership to Gulf Coast Properties, Inc., which had previously owned fifty per cent of the Florida paper company.

New officers of the St. Joe Paper Company are: Edward Ball, president; W. T. Edwards, vice president in charge of operations; Henry W. Dew, vice president in charge of sales; Irene Walsh, secretary and assistant treasurer, and R. L. Main, treasurer.

◆

▶▶▶ *John E. Begley* has resigned his position as director of sales in Eastern New England for the American Tissue Mills of Holyoke, Massachusetts. He has established an office in Boston where he will conduct a paper sales house.

◆

▶▶▶ *Colonel George A. Richter,* formerly director of research for the Brown Company, has resigned from the company, it was reported recently.

M. O. Schur

M. O. Schur has been appointed director of the Brown Company's newly-organized research and development department.

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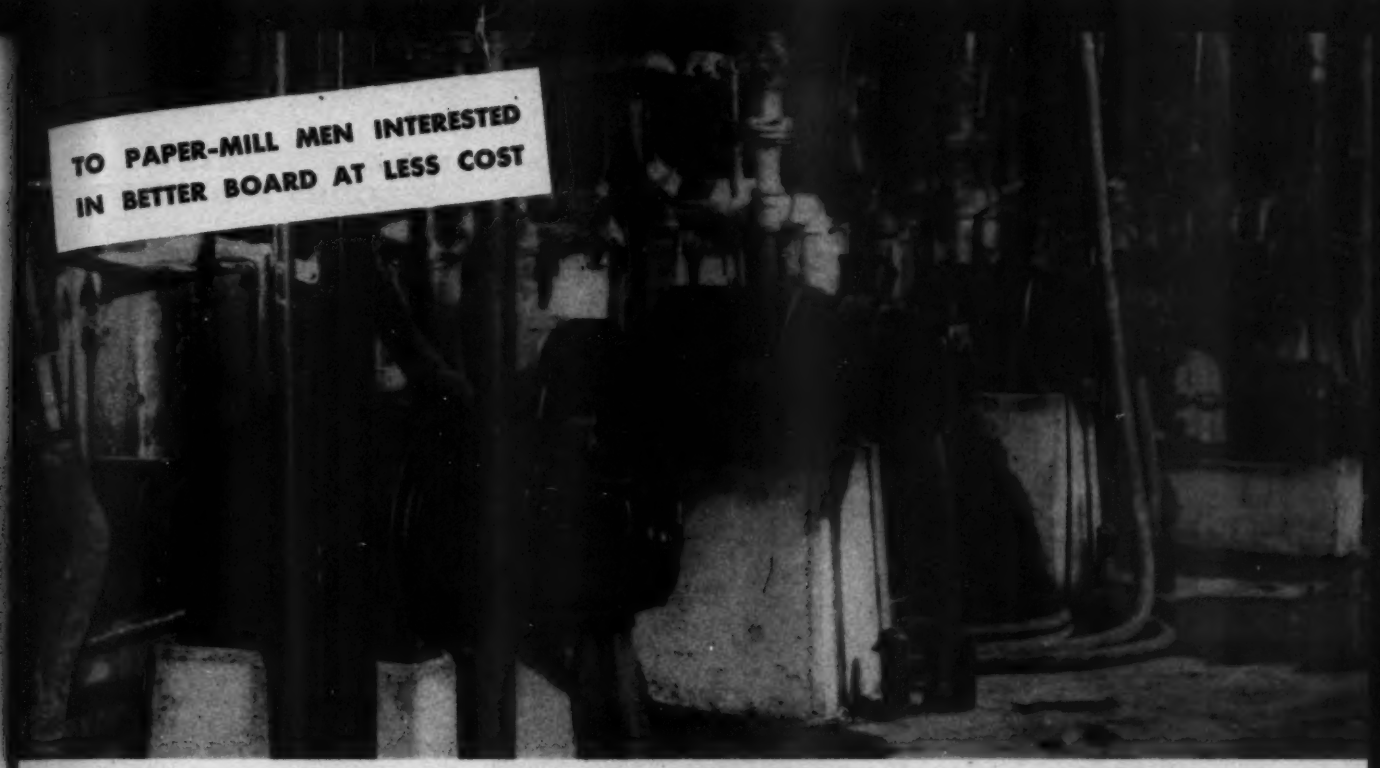
▶▶▶ Formerly in charge of the Philadelphia sales office of the Babcock & Wilcox Tube Company, *Harvey Wilson* is now head of the company's New York office where he will also have



INDIVIDUAL DRIVE AT WET SECTIONS

Prolongs Felt Life – Makes Better Board

MODERN ELECTRIFICATION

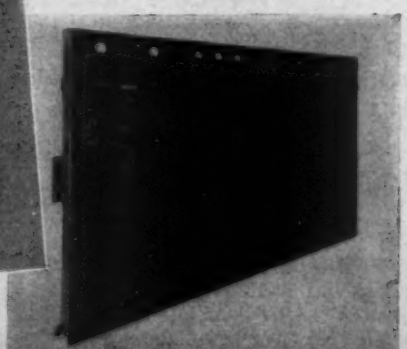
Following are 10 of the modern applications of electricity to paper mills devised especially by General Electric to improve productive efficiency.

1. Automatic tension control
2. Turbines with 3-arm governing mechanism
3. Progressive draw adjustment
4. Turbines with wide-range electric governors
5. Regenerative tension winder drives
6. Sectional paper-machine drives
7. Selsyn draw adjustment from front of paper machine
8. High-speed voltage regulators
9. Photoelectric register control
10. Direct-connected chipper motors

THE latest report from a well-known mill* operating three wet-section drives proves these advantages:

1. **Felts last 75 per cent longer.** Because the bottom felts are no longer used as belts, to haul the load of the wet end, but only to remove water and to carry the sheet, they lasted one and three-fourths times the life of felts of the best quality when no individual drive was used.
2. **Removes more water.** Because the felt can be designed largely for absorbent qualities rather than as a compromise of strength, elasticity, and absorbency, wet-end felts remove more water—where the cost of water removal is lowest—when individual drive is used.
3. **Board Prints Better.** Another advantage is the greater uniformity of board produced using individual drive. The sheet prints more readily and has a better count.

There are other advantages to be had by the use of individual drive. For example, felt stretch can be controlled positively and accurately. For particular information on this or any other type of electric drive for your mill, get in touch with the nearest G-E representative, or write General Electric, Schenectady, N.Y.



Above: Individual drive with totally enclosed, force-ventilated d-c motors.
Below: D-c motor and generator panel for individual drive.

*Name of mill on request.

GENERAL ELECTRIC

TROUBLE

REDUCED PRESSURE

jurisdiction of the Philadelphia office. *R. M. Lackner* has been transferred from Detroit to the Philadelphia headquarters.

◆

▶▶▶ *Dr. John S. Bates,* prominent in the international pulp and paper industry, was given the honorary degree of doctor of science by Acadia University, at its recent convocation. Dr. Bates is now associated with Price and Pierce, Ltd., of London, England, in charge of the Montreal office.

◆

KELLOGG ADDRESSES SALESMEN'S ASS'N

R. S. Kellogg, secretary of the Newsprint Service Bureau, was the main speaker at a recent meeting of the New York division of the Salesmen's Association of the Paper Industry. Mr. Kellogg outlined what he saw in paper mill developments during a long tour of Canadian and American mills and reported a notable tendency throughout the industry toward eliminating wasteful processes and toward a more efficient operation. "Commodore" Kellogg is now on a cruise in southern waters, sailing, his own craft which was built to order a couple of years ago for coastwise navigation.

PULP
BLEACHING
COMPANY

■

WAUSAU
WISCONSIN

■

CELLULOSE
PURIFICATION

▶▶▶ Now plant manager of Sherwood Machineries, Ltd., Sherbrooke, Quebec, is *R. Eric Crawford,* formerly of Dominion Engineering Works, Ltd. Prior to his Canadian affiliations, Mr. Crawford was connected with the Bagley and Sewall Company, Watertown, N. Y.

◆

▶▶▶ The Canadian Forestry Corps has reached full strength and has been undergoing training at central camps. The corps is under the command of *General John B. White,* vice president of the Canadian International Paper Company who commanded the Forestry Corps in the last war.

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▶▶▶ *J. R. Simpson* is now in charge of the newly-established chemical sales office of the Pittsburgh Plate Glass Company in the southeast. The office

J. R. Simpson

will be established at Charlotte, North Carolina, after February 1, 1941. Mr. Simpson is a graduate of Duke University.

◆

▶▶▶ *J. P. Parsons,* after an interim of twenty years, has returned to the firm of Parsons & Whittemore which his father assisted in founding. He will assist in the development of export markets after a long service with the International Paper Company.

◆

▶▶▶ *John S. McCoy,* vice president and one of the founders of the United Wall Paper Factories, Inc., retired on October 31 after more than forty years in the industry. He will continue as a director. The company also announces the appointment of *William Burton* as a vice president and *Walter R. Hummel* as comptroller.

N. I. A. A. ELECTS DODDS PRESIDENT

Now president of the National Industrial Advertisers Association, is Richard P. Dodds, advertising and sales promotion manager of the Truscon Steel Company, Youngstown, Ohio, who was elected to the executive post at the recent annual conference held in Detroit.

Mr. Dodds was formerly associated with the Delta Oil Company and the Skelly Oil Company. In 1930 he joined the Minnesota and Ontario Paper Company, Minneapolis, and in 1934 became manager of advertising at Truscon. In 1938 he was appointed a member of the public relations committee for the Youngstown District of the Republic Steel Corporation.

Vice presidents elected at the annual NIAA conference were E. J. Goes, Koehring Company; H. V. Mercready, Magnus Chemical Company; Terry Mitchell, Frick Company; W. D. Murphy, Sloan Valve Company; L. J. Ott, Ohio Brass Company, and R. T. Reinhardt of the California Corrugated Culvert Company.

◆

▶▶▶ *I. L. Gartland* is now president and chairman of the executive committee of the D. M. Bare Paper Company, Roaring Springs, Pennsylvania, it was announced recently. He succeeds *Ivan E. Garver* who was elected chairman of the board. *Carl Martin* was named treasurer to succeed *L. F. Garber* who has retired.

◆

▶▶▶ *W. T. Roundy,* formerly connected with the Cutler-Hammer, Inc., merchandising and resale sales departments, is now located at the Cutler-Hammer Atlanta (Georgia) office where he has been assigned to the State of Florida. Mr. Roundy will make his headquarters in Orlando.

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▶▶▶ *Jack Wheeler,* formerly in charge of export traffic for the Price Brothers Sales Corporation, is now in charge of all the traffic of that company, says a report for Canada.

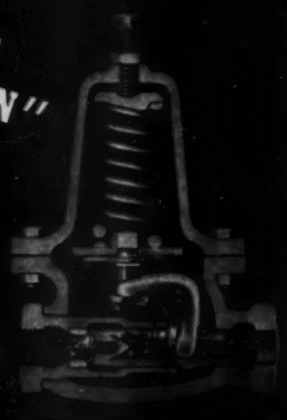
◆

ELECT OFFICERS OF PACKAGING INSTITUTE, INC.

The annual meeting of the Packaging Institute, Inc., held on October 10, in the Westchester Country Club, Rye, New York, resulted in the election of the following officers:

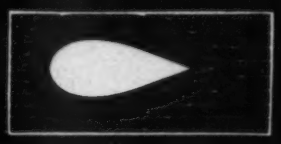
Carl H. Lambelet, president of the New Jersey Machine Corporation, president; George R. Webber, of

NO TROUBLE "SPEEDS PRODUCTION" "STOPS SPOILAGE" "Dependable" "HIGH CAPACITY" "No Service Attention"



REDUCED PRESSURE *Never* VARIES

The streamlined flow offers unusual value to all users. It means no turbulence, just smooth, straight as an arrow flow. You are easily able to meet peak demand and yet hold the reduced pressure constant at the same time. Even though supply line pressure changes or demand changes, you still have smooth action—close, dependable regulation. You experience no spoilage results due to erratic pressure — because the reduced pressure never varies.



A CASH STANDARD "GET ACQUAINTED" COLUMN

Straight line flow all the way — straight as an arrow. Look at the phantom streamlined valve at the left — note the housing which contains the inner valve — you could easily mistake this housing for a pipe running straight through—straight as an arrow. We just emphasize in this way the reason why you get the straightline flow in the streamlined type 1000. CASH STANDARD Valves you buy — also it is the reason for such enthusiastic comments by users that you can read on this page.

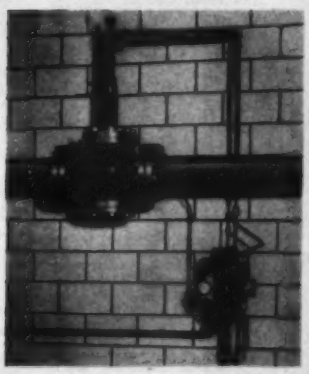
VALVE TURBULENCE ELIMINATED

The valve increases performance results by eliminating the ordinary valve turbulences indicated in illustration above. There is no detour around a dividing wall — the direction of flow is not changed at right angles because of a cast wall—also, the flow is not broken up by valve stems, springs, or other parts.

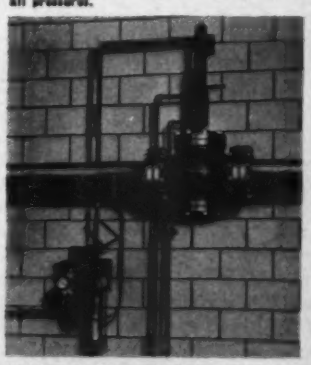
Straight as an Arrow

Question: "Don't you people make anything besides that Streamlined Valve you talk about so much?"

Answer: "Yes Sir; we do! And we propose to picture one or two of them here each time."



A revelation in precision control — the Cash Standard Balanced Lever Valve (Type 42-AC-R) being operated by a Type 100 Controller. Reducing steam at high pressure and high temperature, it has an Air Cooled Stuffing Box. Has valve stem lubricator, valve stem integral with inner valve, roller guides — no lost motion. Sizes: ½" to 12"; all trims; good for most fluids; and for practically all pressures.



And here is the same Valve and Controller, but with a Water Cooled Stuffing Box. This combination could be used for pressure reduction; but it is shown in use for precise back pressure control. Both cuts show a Hand Control Valve on the "100" Controllers. With it, you can interrupt automatic control, and take over control by hand, using the Hand Control Valve lever to manipulate the Balanced Lever Valve as you please, or lock it in any open or closed position you desire.

CASH STANDARD *Streamlined* TYPE 1000 PRESSURE REDUCING VALVES

give you much more in production results at much less in cost . . .

Up above we say, "No Trouble" — "Speeds Production" — "Stops Spoilage" — "Dependable" — "High Capacity" — "No Service Attention" — then again at the left, experience has much to say —

— You can prove all this for yourself by using a CASH STANDARD Streamlined Valve FREE for 30 days. This NO COST trial opportunity is being taken advantage of from far and wide — tell us to ship you one on 30-days free trial. After 30 days you get a bill — you either pay for it then or return valve to us at our expense.

READ THE FACTS IN BULLETIN 1000

. . . . IF YOU GO BY PERIENCE . . . . . u'll Buy the Type 1000

nd what experience says

y men say —
eamliners are accurate —
y never have to be touched —

r men say they specify your Streamlined Valves because they are accurate, and me they never had to touch one of them they were installed. I don't see how could wish for a better report."—Case 338.

ales having Streamliner —
ds one two years old — Forgot ut it because it gave no trouble —

was sincere when I told you we had no eamlined Valve here because I look after the Valves. But since you gave me the and order number I looked into it and I can say is—You're right. There is here. But nobody has had to look at it e it was installed two years ago. I'm you came back at me because I'm ng for Valves like that."—Case No. 380.

of Valves —
t be working well —
ause no troubles reported —

've got a lot of your Streamlined Valves and they must be working well because en't had a single case of trouble re- ed on them. When something works we usually stick to it, so you'll be ring from us right along."—Case No.

ated dependable Valve —
eamliner stood lab tests —
ears of plant experience confirm test —

ught the first '1000' Valve because re on the hunt for a dependable Valve. oratory tests were so good we standard- on it. Plant use confirmed lab tests. practically no trouble with any of Valves over a five year period — we ot on the hunt any more."—Case No.

A. W. CASH COMPANY
DECATUR, ILLINOIS

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Standard Brands, Inc., vice president and A. Vernon Shannon, Westfield River Paper Company, vice president. Included among those elected to the board of directors of the Institute were: Bryant W. Langston of the Samuel M. Langston Company, E. A. Throckmorton of the Container Corporation of America and Stanley L. King of the Monsanto Chemical Company.

◆

AMERICAN BRAKE SHOE APPOINTS BLACK PRESIDENT

The appointment of W. M. Black as president of the American Brake Shoe and Foundry Company's Manganese Steel Division was announced recently by W. B. Given, Jr., president of the parent organization.

Mr. Black, general sales manager of the division since 1934 and a vice president since 1935, has been with Amsco since 1912 with the exception of the war years when he served as a lieutenant in the U. S. Ordnance Department. The American Manganese Steel Division of Amsco, was formerly headed by W E. Crocombe who remains as president of the American Forge Division of the company.

◆

ROGER W. BELL NOW MILL MGR. OF D. M. BARE

Formerly vice president and general manager of the American Writing Paper Company in Albany, New York, Roger W. Bell has been appointed mill manager of the D. M. Bare Paper Company, Roaring Springs, Pa.

It is not known what changes are forthcoming at the APW company to replace Mr. Bell but it was understood, unofficially, that for the present APW's president, D. G. W. Hollister, plans to take over a part of Mr. Bell's duties. While active with the American Writing Paper Company, Mr. Bell served as secretary to a subsidiary concern, the Hygienic Supplies Corporation.

Necrology

W. A. HUPPUCH

Winfield A. Huppuch, formerly president of the United Wall Paper Factories, Inc., passed away October 7 at his summer home on Lake George, New York. He was 78 years of age and had been retired for some time.

Mr. Huppuch helped organize the Standard Wall Paper Company of which he became president. When his company and several others merged in 1927 as the United Wall Paper Factories, Inc., he became president. He was also connected with other paper industry companies during his career and was intensely interested in politics.

Surviving Mr. Huppuch are a son and two sisters.

◆

▶▶▶ *Morrison Mills,* Eastern district manager of the Construction Equipment Division of the Chain Belt Company, Milwaukee, Wisconsin, passed away September 25 in Philadelphia. Mr. Mills was 37 years of age and was a graduate of Harvard University.

◆

GUS RIEDEL

After several months of ill health, Gus Riedel, founder of the brush manufacturing shop in Kalamazoo, Michigan, which bears his name, passed away October 23 at the age of 73 years.

Mr. Riedel started in business in Holyoke, Massachusetts, in 1890, soon after coming to this country. In 1906, he established a plant at Paw Paw, Michigan, later moving to Kalamazoo to better serve the mills of that section. His shop supplied brushes for many of the paper coating plants.

◆

▶▶▶ *Frank A. Soy,* assistant general superintendent at the Riverside (Quebec) mill of Price Brothers and Company, passed away recently. Mr. Soy, who had been in ill health for quite some time, was 39 years of age.

◆

▶▶▶ *Grant M. Fowler,* general superintendent of the Powell River Company, passed away October 11 in Vancouver. Mr. Fowler, who was formmerly connected with the Laurentide division of the Consolidated Paper Corporation, was 43 years old.

◆

FRANK G. FEELEY

Frank Goodrich Feeley, mechanical engineer and since 1937, general manager of the E. D. Jones Company, Pittsfield, Massachusetts, passed away October 20 at the age of 64.

A native of Pittsfield, Mr. Feeley was graduated from the Massachusetts Institute of Technology in 1897. Before joining the paper mill machinery firm, Mr. Feeley was associated with the M. D. Knowlton Company, Eastman Kodak Company and the Niagara Fire Extinguisher Company. He was a trustee of the City Savings Bank of Pittsfield.

Mr. Feeley is survived by his widow, one daughter and one son.

▶▶▶ Widely known as an engineer, *W. B. Hosford* passed away in Mishawaka, Indiana, October 27, at the age of 98 years. Mr. Hosford settled in Mishawaka in 1884 when he became vice president of the Dodge Manufacturing Company of that city. Mr. Hosford was said to be one of the oldest members of the Masonic lodge in America.

◆

CORRIL A. HUBBARD

Founder and president of the C. A. Hubbard Paper Company, Kalamazoo, Michigan, Corril A. Hubbard passed away October 13 at the age of 67.

Mr. Hubbard had been in the paper business in Kalamazoo for the past 20 years, formerly being connected with the Bryant Paper Company as sales manager. He was also a director of the Mastercraft Corporation, Kalamazoo.

◆

CARL E. WHITNEY

On Monday, October 28, Carl E. Whitney, attorney who for years was prominent in the legal firm which served as counsel for most of the associations in the paper industry, passed away at the age of 64 years.

From 1909 to 1913, Mr. Whitney was Assistant United States Attorney in New York, after which he became a partner in the firm of Wise, Whitney & Parker, now Wise, Corlett & Canfield. His firm for many years has represented the American Paper and Pulp Association and has also served other paper industry organizations. Mr. Whitney retired from the firm a year ago.

◆

HENRY H. TIMKEN

One of the best known figures in American industry, Henry H. Timken, chairman of the Timken Roller Bearing Company, Canton, Ohio, passed away October 14 at the age of 72.

Mr. Timken, whose father developed the roller bearing and a revolutionary carriage spring, was born in St. Louis, Missouri. He entered the University of California and received his law degree from that institution. When the senior Mr. Timken started a carriage business the son joined with his father in the concern. Later this company was moved to Canton, the axle business later becoming the Detroit-Timken Axle Company of Detroit.

Survivors of Mr. Timken include his widow and three sons; Henry H. Timken, Jr., vice president of the Timken firm; Robert Timken, also an executive, and John Timken of Cambridge, Massachusetts.

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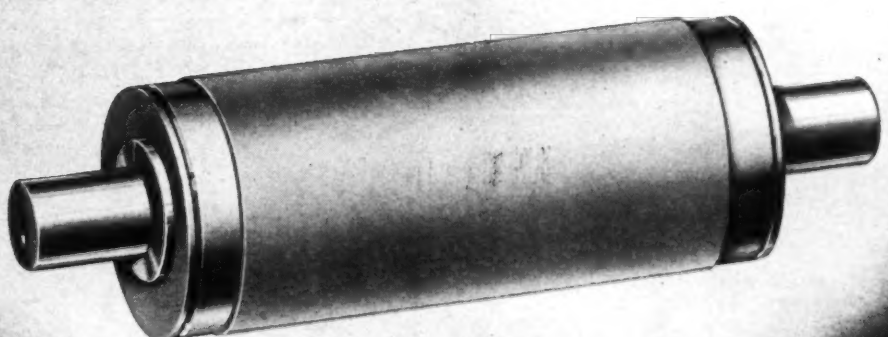

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Convention Papers . . . Abridged

Safe Handling of Materials

J. A. LONG, Superintendent
Bay West Paper Company

The subject "Safe Handling of Unit Materials," assigned to me by our general chairman, is supposed to cover unit materials such as bales, rolls, laps, boxes, barrels, crates, etc.

No doubt the reason that I was selected is because of the safety record established at the Bay West Paper Company. The record of 39 months without a lost time accident belongs to our employees. They built up the record and we are very proud of them for it. To credit a record of this kind to any particular individual in our company would be unfair to all the others.

The small mill or converting plant usually is not adequately equipped as a rule to handle their materials as compared to the large mills. In my opinion there are three basic reasons for making this statement:

1) Large mills construct their buildings to best meet their production requirements. The safe handling of their materials is taken into consideration with these production requirements. Many converters like the Bay West Paper Company, operate in rented buildings and there isn't always sufficient space for the safe handling of each material.

2) Large mills think very little of purchasing proper and expensive equipment with which to handle their materials. Small plants can seldom afford to buy expensive material handling equipment to install in a rented building which usually is not laid out properly for such an installation.

3) Another comparison is that of man experience—the large mills usually have certain men trained to handle each material. The stockroom men in the converter's plant must know the safe method of handling all materials involved. They must know how to safely handle rolls of paper in various sizes and weights, how to pile finished cases in freight cars and warehouses, how to store bundles of cartons knocked down, how to handle bales of broke (waste), how to move heavy machinery—yes in some instances they are expected to be machine operators as well.

However there is right and wrong equipment as well as right and wrong methods in handling unit materials of any kind and that is my point; the right equipment for the job.

(At this point Mr. Long used lantern slides to depict right and wrong ways of handling unit materials. Several of the illustrations have been reproduced herewith.)

Figure 1—About seven years ago our men used planks to triple deck rolls 40 inches long, 33 inches in diameter and weighing from 500 to 600 pounds. It took four men to triple deck each of these rolls and the method was slow and also far from the straight and narrow safety path. Many strains developed from this daily practice.

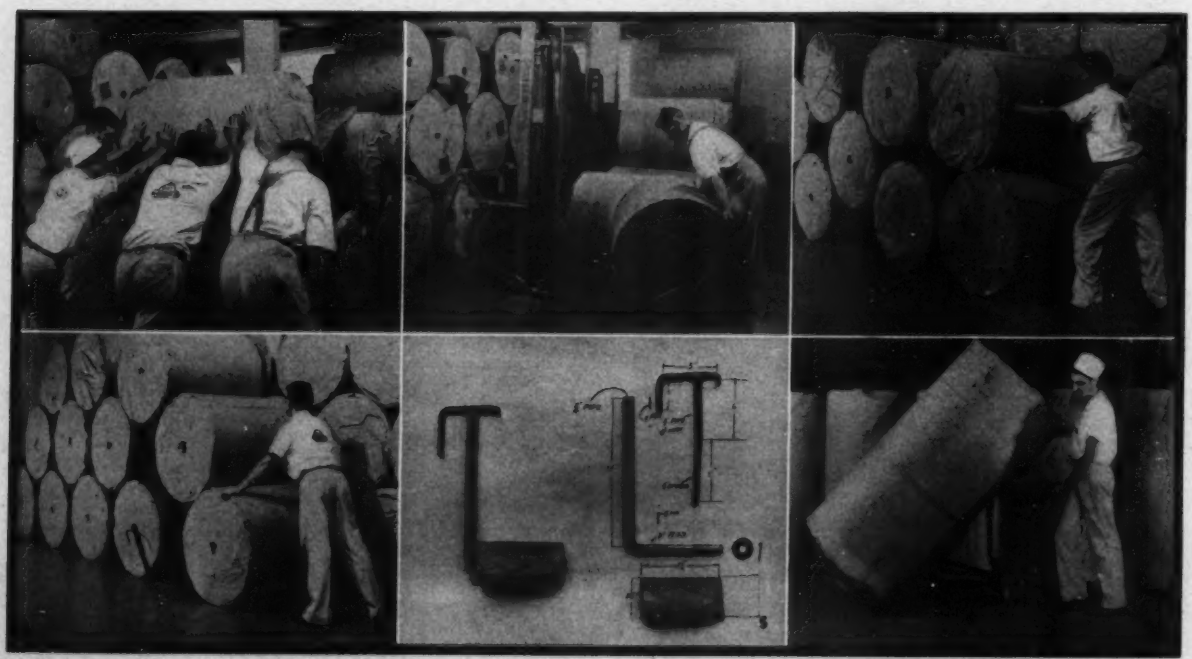
Figure 2—Let me call your attention again to the fact that our mill is small. We have to be sure that equipment of this kind isn't too large or bulky for our needs which would discourage its use by our employees. Note how the platform with turned down edges, lowers to within one inch of the floor so that stock can be easily rolled onto it from the front or from either side directly from the floor surface.

Figure 3—Note that the second roll from the front of the pile has not been properly blocked and the roll hauler knocks out the block from the front roll. Immediately the rolls in the second and third tiers force the bottom rolls out and all the six rolls are soon out of the roll hauler's control. He is forced to leap for a safe spot allowing the rolls to go at will.

Figure 4—Rolls such as these, triple decked (nestled or cradled) can very easily be removed safely from the pile, one at a time. However, this can only be done safely when the second roll from the front of the pile is securely blocked. When this is done the roll hauler has complete control of the three rolls being removed.

Figure 5—This block is nothing more than a regular wedge-shaped hard wood block about 7½ inches long and a ¾-inch iron rod running through its length with a washer and a cotter pin to keep the block in place. The other end of the rod is bent at a right angle and is welded to an iron ¾-inch pipe 14 inches long. Into this end of the pipe, a ½-inch iron rod

Herewith are presented abridgments of some of the papers that were read at the Paper and Pulp Section of the National Safety Council at the annual congress which met in Chicago, October 7-11, 1940.



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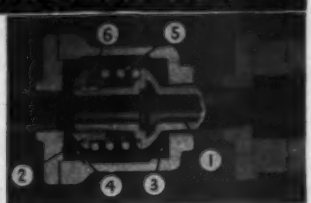

The Johnson Rotary Pressure Joint Nipple (1), fastened to roll. Sliding collar (2), keyed (6) to nipple. Carbon-graphite rings (3) & (4) which eliminate oiling and packing. Spring (5) is for initial seating only—joint is actually pressure-sealed.

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Rotary PRESSURE JOINT

or pipe is inserted, on the end of which is attached a six-inch spring. The other end of the spring is pinned firmly to the lower part of the pipe which pulls the rod down into the pipe until the handle brings it to a stop. In order to keep the block in a fixed position while it is being handled, the rod going into the pipe has a ⅛-inch slot and a pin is then installed through the pipe and the rod. The handle of the blocking device is a ⅜-inch iron rod welded horizontally across the top end of the spring rod. The outside end is bent downward to form a hand grip while the opposite end is also bent slightly downward with a sharpened point. This is the inside end of the handle and is inserted into the core after the block has been placed under the roll and the tension placed on the spring.

Figure 6—Note the turned down handles making it easier for the operator to handle it with his hands in a natural position away from the roll. These handles also serve as an extension so that the operator has better visibility over the roll when moving forward. The third or rear ball bearing wheel, because of its central location, allows the operator a natural walk which is essential in the same operation of this type truck. All the wheels are large enough to assure easy handling. This truck is not a new idea, at least to the mill that we have purchased it from—it is about fifteen years old and while they have sold a few, most of them are used in their own plant. During the time that we were looking for this particular truck, we had the experience of having this truck demonstrated to us by a large mill near Green Bay and personally I believe it has a lot of merit as a small heavy duty all-around safety truck.

DISCUSSION

Several interesting questions were raised after Mr. Long concluded his talk.

One member asked if Mr. Long had any trouble with his men ever having their hands injured when using a two-wheel truck to which Mr. Long replied that he had never had an experience of that kind and that this type of truck was used mostly for unloading, taking the rolls from the truck and standing them on end.

Another member remarked that he didn't notice any foot brake on the wheels on an ordinary two-wheel truck. Mr. Long explained that he has foot brakes on all the two-wheel trucks and that it is always possible to block the front two wheels.

The question of handling bulk sulphur was then brought up and the general chairman stated that he hadn't seen any vacuum or suction system used in handling this material but that the men wear respirators.

Practical Uses of Accident Cost Data in the Safety Program (From a Safety Director's Standpoint)

J. A. DRAPER, Director of Safety
Consolidated Paper Corporation, Ltd.

This paper makes no suggestions as to how accident cost data is, or should be collected and compiled. We are assuming that such data is available from the accounting or insurance departments. We are also assuming that by accident costs we mean dollar and cents. We are not going to discuss human values; pain, worry, missed opportunities, etc., etc., although to my mind these costs are far more important than is the actual money costs of accidents to industry.

By and large, if there is one man in a mill who is as keen or keener to prevent accidents and to show an improvement in accident experience than the safety man, that man is the mill manager. I have yet to see a plant wherein that statement does not hold true.

I am going to describe how we have formed our accident cost figures into an accident prevention tool and how that tool is placed into the hands of our division managers.

Early each month our safety inspectors receive the accident cost statements for their respective mills from the insurance department. This statement shows the money paid out by the Workmen's Compensation Commission during the preceding month, for each individual accident case. From this sheet the safety inspector prepares a statement showing the accident costs by departments and this is sent to the division accountant who incorporates the accident costs by departments as a footnote to the departmental cost sheets. The footnotes show the accident costs for the month and the cumulative total for the year to date, for each individual department.

These figures are discussed between the manager and superintendents at the monthly cost meeting.

The manager makes appropriate remarks when reviewing the costs of the departments that show very little or no cost for accidents. In the case of the other departments or department, it is pointed out that accident costs are by no means a small item. The manager wants to know what caused that accident or those accidents. What has been done about it? Has the floor been fixed? Are there any more such bad spots in the floors about the plant? Have those truck handles been altered so that we will have no more broken toes? Are you encouraging your men to wear safety shoes? Are you insisting that your men obey safety rules? So you show to your whole personnel by your words and actions that you are right behind our safety work and are determined to do your utmost to prevent accidents? Those are some of the points that can be brought before the supervision of a plant by the manager at a cost meeting.

Cost meetings are to discuss ways and means of reducing costs. Accidents are a needless waste and therefore are a legitimate subject at such meetings. The personnel at cost meetings are also the very men, who, in many cases, are and in all cases should be, among the most enthusiastic safety workers in the plant.

The money costs of accidents is far from the most important reasons for installing guards on machinery. It is probably the least important. Nevertheless a safety director can use the proved savings of guards in one instance to help sell the idea of installing guards or making improvements in other places.

Let me give you an instance. Many years ago the winders for our newsprint machines at two of our mills were not equipped with guards for the in-running nip between the winding roll of paper and the drum. Accidents were fairly frequent and nearly always serious. They ranged from pinched fingers to fatalities but usually resulted in mangled arms. The cost of these accidents was very high, sometimes ranging into thousands of dollars per year per mill. Again let me emphasize that the money costs is small compared to the less in human values. I never want it said that "This man tries to prevent accidents chiefly because they cost money."

To get back to our winders—some years ago the winders were equipped with simple guards. The cost was in the neighborhood of $100 per winder. Total cost for the two mills certainly not over $1600. The spending of this modest sum has virtually eliminated our nip point accidents at those winders. Based on our experiences before installing guards we can say that they are saving at least 100 per cent of their cost per year.

A safety director naturally would know the rate his company is paying for accident insurance.

He should also know how much this money amounts to in a year. He should know what rate was paid for previous years; how much money is being saved because of an improving accident experience, and he should be able to compare the insurance costs in his state or province with the costs that prevail in neighboring states or provinces. He should be "cost conscious" and be able to prove, in conversation, that he has a larger grasp of his job than that necessary to install guards, address safety meetings and compile accident statistics.

To sum up:

1) Accidents costs can be formed into a useful accident prevention tool and wielded most efficiently by managers at cost meetings.

2) A safety director should be able to cite concrete examples where money spent on accident prevention has brought in handsome returns and be able to use such cases as an argument to secure further improvements.

3) He should know his company's present accident costs, be able to compare such costs with previous years and with comparable industries in other parts of the country.

DISCUSSION

The general chairman stated that there is no known unit of measurement to measure human pain and suffering and anxiety and that until such an instrument was available, the dollar-and-cents cost forms just about a good a unit of measurement as any other.

One member asked if the accident cost figures include the cost of first aid dressings or just compensable accidents. The general chairman said that in most cases the companies have born the cost of the first aid treatment.

Another member stated that when accidents occur you have, in addition to the premium paid out, medical first aid expenses, spoiled materials, possible damage

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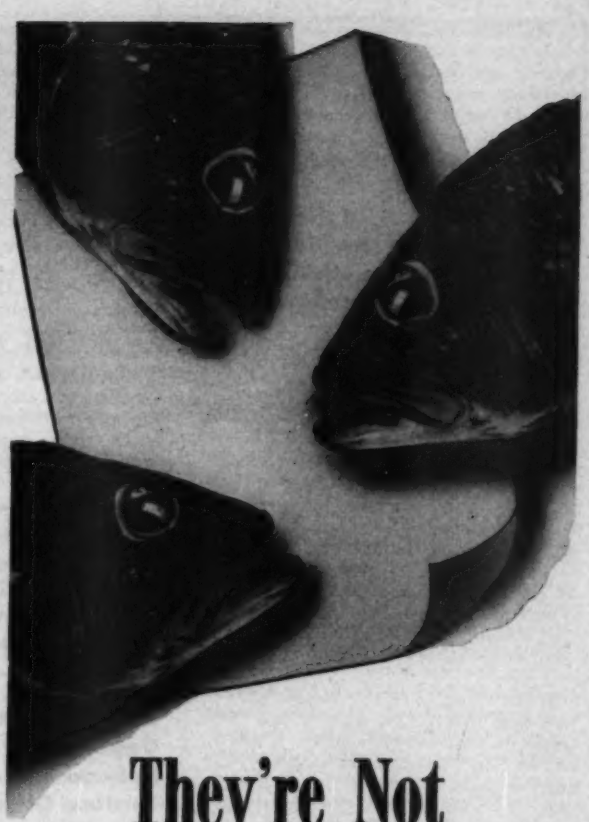

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to equipment, etc. Why not, he asked, include these in the accident costs. He urged keeping separate the compensation cost and insurance cost but keep the other costs (indirect costs). The general chairman agreed with this thought but stated that it was a difficult thing to do on most instances.

Practical Uses of Accident Cost Data in the Safety Program (From the Viewpoint of the Senior Executive)

E. E. GRANT, President,
The Crystal Tissue Company

The seriousness of accidents and the frequency with which all of us are well acquainted have lead me to believe that we should pay plenty of attention to accident statistics.

I have come to the belief now that accident costs are just as good a barometer to use as are the severity and frequency rates in our mill. Increased accident costs immediately inform me that either more accidents are happening or that those happening are of longer duration.

From this information I know that less money will be available for stockholders and wages and that the cost of our product is being taxed for waste which we cannot afford and which we cannot easily explain since all of us must endeavor to be economical in the operations of our industries.

Accident statistics or cost data really start with the departmental accident report and include the report to the State Industrial Commission with the medical, hospital and compensation awards and finally ends with the settlement sheet and the semi-annual checks to the Industrial Commission.

The direct costs can be used for cost data which we make use of or ignore as we please but we cannot get an accurate cost for damage to machinery, effect on fellow workers, suffering to the injured employee or the cost assumed by the family of the injured person.

A study of the cost data and statistics may not be available to many executives due to the fact that they have not been properly introduced to these figures because they were not on a balance sheet or the profit and loss statement of the company.

I want to read a paragraph from the monthly accident statistics report for Ohio compiled by the Department of Hygiene for the month of May:

"The 16259 injury and occupational disease claims filed with the Industrial Commission in May, an increase of 968 over the preceding month, reflects a gradual increase in employment as shown by research reports, especially in the heavy industries. The 81 fatal claims filed is a decrease of 18 over April."

This was the first time I had been forcibly struck with the fact that accidents were being used as barometers or indicators of employment.

It sometimes pays to check up in the old book and find out what we did ten or twenty years ago and check with today's records. We occasionally get in a rut or have a complacent feeling that we are going fine and a check-up on past performances may show us that after all there was a time when conditions were even better.

Many of our present employees have been with us for many years and these figures over the last ten to twenty years are the figures of their performances. These figures for us are only those of an individual company but are the same as those kept in the files and being used by our state actuary in charging our compensation account periodically and determining as to whether we are average or entitled to penalty or credit.

Accident costs are a tax on industry just the same as excess profits tax, social security or real estate taxes but are levied by the careless employer and the untrained or thoughtless employees.

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Accident cost data interest us in keeping costs down as our business is very competitive and from a personnel viewpoint we are more deeply interested as most of our employees have been with us for more than ten years.

DISCUSSION

A question was raised as to how many men keep their accidents costs on a cost per one-hundred-dollar-of-payroll basis and several present indicated they kept accident costs in this manner.

Another member asked if the costs of accidents include the hidden costs or merely the dollar and cents paid. Mr. Grant stated that they did not include the hidden costs as it is difficult to do this. He also stated that his company never included cost of the guarding program but that this item was charged to manufacturing expense.

Abridgments of papers presented at the annual meeting of the Technical Association of the Pulp and Paper Industry, held in New York City, February 19-22, 1940, appeared in the March, April, May, June, August, September and October issues. This issue records another installment.

Report of TAPPI Water Vapor Permeability Subcommittee of Paper Testing Committee

G. J. BRABENDER (Chairman)
Chemical Engineer, Technical Department
Marathon Paper Mills Company

The proposed method of determining the water vapor permeability of paper and paperboard is based on the work done on this subject by the subcommittee of the TAPPI paper testing committee. Essentially, the method consists of hermetically sealing the test specimen to the aperture of an open-mouthed dish containing a strong desiccant. The assembly is exposed with the desiccant in contact with the sheet surface to circulating conditioned air at 21 deg. C. and 65 per cent relative humidity in a test room or cabinet. Weighings of the assembly are made at intervals during the test in order to determine the rate of gain in weight of the assembly, thus providing data from which a time-weight change curve may be plotted. The water vapor permeability is determined from this curve and is expressed as grams per square meter per 24 hours at 21 deg. C. for the moisture gradient defined by the test conditions.

A supplementary method consists of the use of water instead of desiccant inside the test cell. In this case the dimensions and shape of the cell are specified within certain limits and the distance between the water surface and test sheet surface is fixed at 25 mm. The assembly is placed in the testing room or cabinet in the upright position while exposed to the circulating conditioned air at 21 deg. C. and 65 per cent relative humidity. The loss in weight of the assembly furnished the data required to determine the water vapor permeability of the sheet.

A problem pertaining to the determination of water vapor permeability which still remains to be solved is that concerning the particular range of humidity chosen for the test conditions. Data presented in the literature and found in the work of the subcommittee indicate that different types of sheet material respond quite differently and specifically to various ranges of humidity. The laws governing water vapor permeability are quite confusing, especially as regards cellulosic types of materials.

A suggestion is made that TAPPI could render valuable service in sponsoring a project designed to remove much of the confusion now existing in the interpretation of water vapor permeability measurements.

Effect of Acid Concentration and Temperature Schedule in Pulping Resinous Woods

G. H. CHIDESTER, Senior Engineer
and
J. N. McGOVERN, Assistant Technologist
Forest Products Laboratory,[1] Forest Service,
U. S. Department of Agriculture

Experiments undertaken at the Forest Products Laboratory in 1936 demonstrated the results obtainable from jack pine under a certain set of commercial operating conditions using a weak acid liquor and indicated the possibility of pulping the heartwood under more favorable conditions, including the use of strong acid liquor and a long time at low temperatures. This indication was later followed by further experiments to determine the minimum time required for the production of pulp with fairly strong acid with reasonably low amounts of screenings. The conditions found favorable for jack pine were then applied to Douglas fir and to southern pine and the experiments extended to show the effects of

(1) Maintained at Madison, Wis., in co-operation with the University of Wisconsin.

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acid strength, maximum temperature, and the retention of sulphur dioxide by the use of higher pressures.

The experiments with jack pine were undertaken at the request of a commercial mill to determine the results obtainable in approximately 11 hours with liquor containing 4.2 per cent total and 1.25 per cent combined sulphur dioxide and also under conditions considered to approach the optimum for lime base liquor. The conditions chosen for the latter were liquors containing a relatively high percentage of sulphur dioxide together with a long time at relatively low temperatures without going too far from conditions possible commercially.

Digestions were made in a 50-pound steam jacketed digester having a stainless alloy lining. The digester proper was charged with ⅝-inch chips prepared from the whole wood. Samples of similar chips of heartwood and sapwood were cooked separately at the same time in perforated alloy baskets placed in the digester.

Having obtained indication of a satisfactory pulping action the next step was to determine to what extent the time could be reduced.

The total sulphur dioxide in this series was 6.5 per cent and the maximum pressure 80 pounds per square inch. The total time was decreased over a range from 17 to 11.8 hours and the maximum temperature increased accordingly from 127 deg. to 136 deg. Cent. to give the same degree of cooking indicated by the bleach requirement. Each digestion was held nearly to the exhaustion of the bisulphite.

Considering 2 per cent screenings as an arbitrary maximum value, satisfactory pulping is evident under these conditions in about 15 hours with a maximum temperature of 130 deg. Cent.

The strength of jack pine pulps was perhaps equal that of a soft pulp from eastern hemlock and considerably lower than that of spruce pulp. The unbleached color, however, was appreciably lighter than unbleached eastern hemlock pulp. The ether solubility of the pulp was sufficiently high to give an indication of the possibility of pitch difficulty.

The pulping of both Douglas fir and southern pine was materially aided by the higher sulphur dioxide content of the liquor and also by a decrease in the maximum temperature and rate of temperature rise to the maximum. The heartwood chips from the two species were not only more thoroughly cooked as evidenced by the smaller amounts of screenings and bleach requirements, but also yielded stronger pulps, especially with respect to bursting strength. Similar trends were shown for the sapwood, although the differences were much smaller owing to the greater ease of pulping sapwood under the less favorable conditions.

In pulping the Douglas fir heartwood the sulphur dioxide concentration effect was in evidence at both high and low maximum temperatures. In both cases the higher sulphur dioxide content resulted in a decrease in screenings of about 12 per cent, a reduction in bleach requirement of about 11 per cent, and an increase in bursting strength of about 0.1 point. The color of the pulp obtained with the stronger acid was lighter in all cases than the color of the pulp that was obtained with the weaker acid.

The higher sulphur dioxide content gave similar results with southern pine. The screenings and bleach requirements were both materially lower and the bursting strength was higher. In spite of low alcohol-benzene and ether solubilities and the seasoning of the wood, the difficulty of pulping the heartwood under the less favorable conditions is evident from excessive screenings.

Lowering the maximum temperature from 145 deg. to 135 deg. Cent. accompanied by a slower rate of rise reduced the screenings from Douglas fir heartwood 5 per cent and the bleach requirement 8 per cent and gave higher bursting strengths. The improvements shown at the lower temperature were similar for both the high and low sulphur dioxide concentrations.

The results obtained from the southern pine by lowering the maximum temperature were again similar in trend to those from Douglas fir.

Both Douglas fir and pine gave lower screenings with the higher pressures, but the differences were less than the previously indicated effects of acid strength or temperature.

Samples of Douglas fir up to 100 years of age and containing as much as 78 per cent heartwood were reduced to a satisfactory degree. However, it is probable that wood of extreme age would require some further modification for complete reduction. In the case of southern pine the data were obtained on only one thoroughly seasoned sample, and the results should be considered only as indicative of a trend.

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Recovery Unit Performance in Burning Kraft Process Black Liquor

L. S. WILCOXSON[1] and F. G. ELY[2]

Black liquor, as compared to usual fuels such as natural gas, oil or coal, or even bark and wood waste, is an extremely poor fuel on the bases by which these fuels are customarily judged. Its heating value is low, being as fired about one-third that of the poorest coals. Its ash or inorganic content is three times as great as those coals, and moisture content is nearly half the weight of the liquor introduced into the furnace. Some idea of these comparisons is given by Figures 1 and 2. Of the organic material, much of the heat of combustion is necessarily utilized to satisfy the demands of moisture evaporation, the heat of fusion and sensible heat of ash, which leaves the fuel-bed in the form of molten smelt, and, in the kraft process to contribute heat to the endothermic reaction involved in the reduction of sodium sulphate to the useful form of sodium sulphide. In common practice, about 25 per cent of the heat of the fuel is utilized for these purposes, which leaves only 75 per cent of such heat available for absorption in the generation of steam.

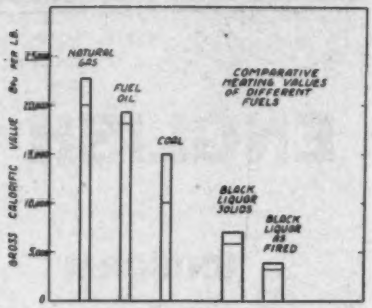


Figure 1

Nevertheless, the economic importance of chemical recovery alone has for many years justified the handling and preparation of black liquor for incineration, and the large quantities of liquor available, even at such low fuel values, makes it an important source of heat for steam production in pulp mills.

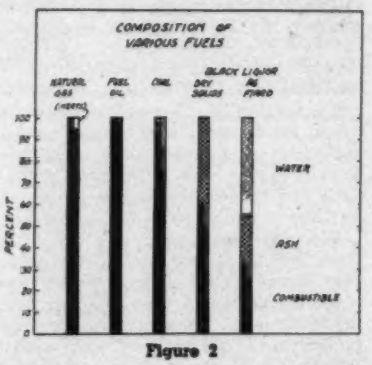


Figure 2

During the past several years, The Babcock & Wilcox Company has conducted a great many tests on boilers of widely differ-

(1) Executive assistant. (2) analytical engineer, The Babcock & Wilcox Company.

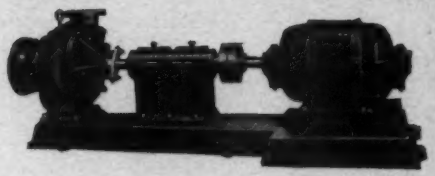
TABLE 1—Test of No. 15 Recovery Unit

1	Test duration, hr.	9.5
2	Boiler	Fig. 3
3	Steam output on test, lb./hr.	50,520
4	Steam press. at superheater outlet, lb./sq. in.	457
5	Steam temp. at superheater outlet, deg. F.	690
6	Feedwater temperature, deg. F.	307
7	Air temp. leaving air heater, deg. F.	358
8	Calorific heat input from fuel, million B.t.u./hr.	98.15
9	Sensible heat (above 80 deg. F.) fuel A.F. million B.t.u./hr.	1.76
10	Heat in preheated air (above 80 deg. F.), million B.t.u./hr.	4.24
11	Total heat input to furnace (above 80 deg. F.), million B.t.u./hr.	104.15
12	Heat of reduction of Na_2SO_4, million B.t.u./hr.	5.52
13	Heat in smelt leaving furnace, million B.t.u./hr.	3.83
14	Latent heat loss fuel moist. & H_2, million B.t.u./hr.	18.93
15	Unburned combustible loss, million B.t.u./hr.	0.84
16	Total heat available (above 80 deg. F.), million B.t.u./hr.	75.03
17	Black liquor fired, lb./hr.	29,110
18	Concentration of bl. liq. as fired, % solids	54.7
19	Temperature of bl. liq. as fired, deg. F.	188
20	Salt cake fed (as Na_2SO_4), lb./hr.	2,040
21	Analysis of bl. liq. as fired:	
22	Carbon, %	18.65
23	Hydrogen, %	1.95
24	Oxygen + nitrogen, %	5.25
25	Sulphur, %	2.40
26	Ash, %	26.45
27	Moist., %	45.30
28	Heating value as fired, B.t.u./lb.	3,372
29	Temperature of smelt leaving furnace, deg. F.	1,550
30	Temperature of black liquor entering spraytower, deg. F.	202
31	Temp. of bl. liq. leaving spraytower, deg. F.	180
32	Concentration of bl. liq. entering spraytower, % solids	48.2
33	Concentration of bl. liq. leaving spraytower, % solids	58.2
34	Total Na_2O in black liquor to furnace, lb./hr.	4,265
35	Total Na_2O in salt cake to furnace, lb./hr.	891
36	Na_2O recovered in dissolving tank, lb./hr.	4,741
37	Na_2O recovered in dust hoppers, lb./hr.	97
38	Na_2O in gases to stack, lb./hr.	204
39	Na_2O unaccounted for including recovery by spraytower, lb./hr.	114
40	Green liquor "reduction", %	95.1
41	Green liquor "sulphidity", %	27.7

42	Section of unit	Furnace	Throat	Boiler Screen	Superheater	Boiler	Air heater	Spray tower
43	Flue gas analysis leaving section: CO_2 %		18.4			15.1		12.6
	O_2 %		1.0			4.8		6.7
	CO, %		0.4			0.16		0.06
44	Total combustion air leaving section, %	105	105	105	105	128	147	147
45	Total weight wet gas leaving section, lb./hr.	98,700	98,700	98,700	98,700	115,600	129,600	139,660
46	Moisture in wet gas leaving section, % by wt.	18.4	18.4	18.4	18.4	15.7	14.1	20.3
47	Adiabatic temperature, deg. F.	2,470						
48	Gas temperature leaving section, deg. F.	1,860	1,770	1,550	1,295	710	536	283
49	Available heat in gas entering sect., million B.t.u./hr.	75.03	53.89	50.93	43.82	35.67	20.63	16.39
50	Heat absorbed, individual section, million B.t.u./hr.	21.14	2.96	7.11	8.15	15.04	4.24	9.20*
51	Heat absorbed, cumulative, million B.t.u./hr.	21.14	24.10	31.21	39.36	54.40	58.64	67.84
52	Available heat absorbed, indiv. sec., %	28.1	4.0	9.5	10.8	20.0	5.6	12.2
53	Available heat absorbed, cumulative, %	28.1	32.1	41.6	52.4	72.4	78.0	90.3
54	Heat absorption, individual section, B.t.u./hr., sq. ft.	15,400	6,850	12,150	5,000	2,070	665	
55	Heat absorption, cumulative, B.t.u./hr., sq. ft.	15,400	13,400	13,100	9,800	4,820	3,320	
56	Actual heating surface, indiv. section, sq. ft.	1,370	431	585	1,629	7,257	6,360	
57	Actual heating surface, cumulative, sq. ft.	1,370	1,801	2,386	4,015	11,272	17,632	
58	Equivalent surface area ($500 \times 10^6 \div$ item 16), sq. ft.	9,110	12,000	15,900	26,800	75,000	117,300	
59	Av. draft leaving section, ins. water	+0.15				—3.3	—6.2	Ent. +0.8 Lv. 0.0

* Item 50 (spraytower) shows heat absorbed from gas only.

STOCK PUMPS

by 

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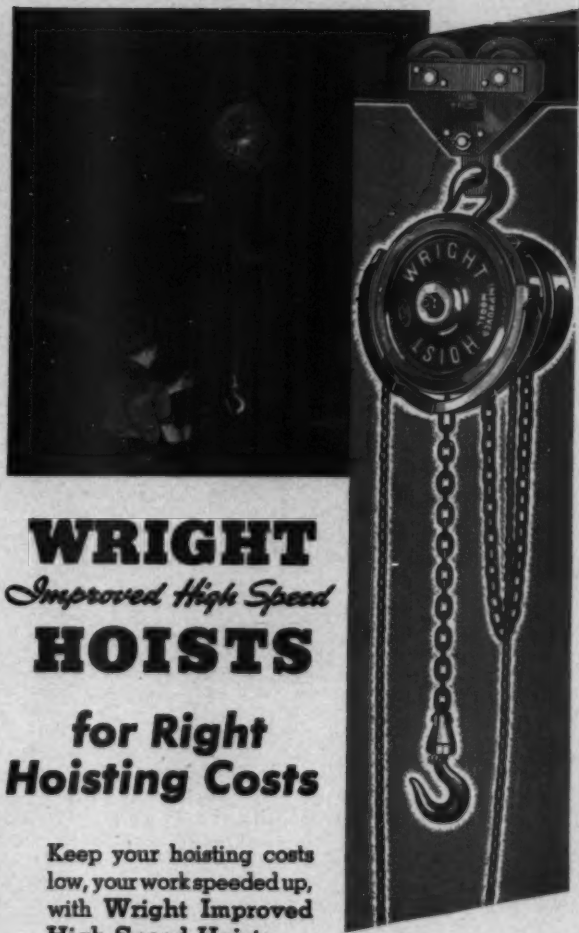

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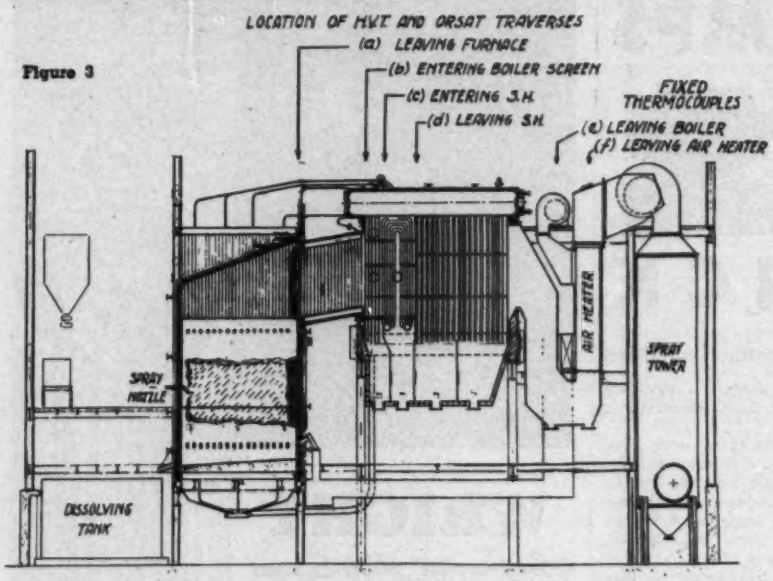
Figure 3



ent sizes and arrangements, and fired by different fuels, with the purpose of studying the practical influence of slagging factors from different fuels, the relative rates of heat absorption by radiant and convection surfaces, and in particular the problem of furnace and boiler design for the practical handling of ash from the fuel. This program of testing has been extended through the courtesy of Gaylord Container Corporation to include a recovery unit burning black liquor from the kraft process. The design of the recovery unit tested is illustrated in Figure 3, and it is felt that the results of these tests and comparisons with other types of units will be of interest.

The unit shown in Figure 3 is designed for a capacity of 28,500 lb. per hour of black liquor of 55 per cent solids concentration, which rate corresponds to an equivalent production of 125 tons of pulp per day based on 3,000 lb. solids per ton of pulp produced. Boiler and superheater are built for 450 lb. per sq. in. pressure and 710 deg. Fahr. total steam temperature, the steam produced being discharged directly into the main steam header of the power plant. The unit comprises a furnace, boiler, superheater, air heater and spray tower and is equipped with forced and induced draft fans.

The furnace is constructed of water-cooled tubes, and the black liquor is sprayed into it by a single oscillating spray nozzle, located at the center of the front wall. The form of the spray is such that an essentially flat, fan-shaped spray of coarse liquor particles is projected across the furnace so as to impinge and adhere to the rear and side wall surfaces, and by the oscillation of this spray the liquor is spread over controllable areas of these furnace walls. A partial dehydration takes place in each particle of liquor in its flight across the hot furnace atmosphere and further drying occurs following its deposition on the wall. In the course of time an accumulation of essentially dehydrated solids or char has formed of sufficient thickness to fall by its own weight to the hearth or floor of the furnace where ignition and active combustion proceed in the path of the primary air jets located as shown in the two side and rear walls. This falling of char from the walls occurs repeatedly and, in effect, continuously from the various areas of deposition, with the result that a continuous supply of fuel is delivered to the hearth and a substantial fuel bed is formed, which stabilizes the cycle of drying in the furnace and promotes reduction of the sodium sulphate that is mixed with the black liquor before firing.

Gases of combustion pass upwardly through the spraying zone and leave the furnace through the water-cooled throat, from which they pass successively over the heating surfaces of boiler screen tubes, superheater tube bank, the main bank of boiler tubes, through the tubes of the air heater, and finally through the black liquor spray-tower or concentrator to the stack.

Smelt or molten ash, which drips from the burning fuel, drains on the sloping furnace hearth toward the tap-hole located at the center of the front wall and issues as a continuous stream from the water-cooled spout to fall into dissolving liquor contained in the dissolving tank shown at the front of the unit.

The fluxing and erosive action of molten alkaline smelt is well known to be destructive to uncooled refractory materials used in smelter furnace construction. It will be noted that in the design of this furnace brickwork and other such materials are completely eliminated and all areas are fully protected by water-cooling. This water-cooled structure not only resists destructive action, but also minimizes the loss of heat by radiation from exterior surfaces. The cooling tubes form a part of the boiler circulation system and contribute very materially to the gross steam generation of the unit. The lower portions of the wall tubes in the furnace, which encounter the most severe action of flame and smelt, are fully studded while the upper portion of the wall tubes and the roof of the furnace are partially studded.

The principal items of observed and of calculated test data are summarized in Table 1 on page 842.

The Relation of the Strength Properties of Multi-Ply Paperboard to the Bonding Between Plies*

DUNCAN S. BROWN, Technical Supervisor
The Gardner-Richardson Company

In paper made of a single ply, there are two primary strengths which affect the over-all strength of the sheet. These are the strength of the individual fibers and the strength of the bond between fibers. In multi-ply board, an additional primary strength exists—the force with which the plies are bonded together. The present investigation was undertaken to determine some of the factors affecting this bonding between plies.

Several different kinds of stock were used, but the larger portion of the experimental work was carried out with unbleached sulphite pulp. All the stocks were prepared by beating in the one and one-half pound Valley beater, the extent to which they were beaten being determined with the Schopper Riegler freeness tester at 20 deg. C. The stocks that were prepared in the laboratory were unbleached sulphite, news-unbleached sulphite (made by beating a mixture of old newspapers and 10 to 20 per cent unbleached sulphite), bleached sulphite, unbleached kraft, and groundwood-sulphite. In addition to these, commercially prepared unbleached kraft, chip, and kraft-sulphite stocks were taken from the line in a board mill to be used in the experiment on the comparison of hand-made and machine-made board, and in certain other experiments.

The Noble and Wood sheetmaking apparatus [Coghill, James, *Paper Trade J.* 102, No. 9:27-44 (Feb. 27, 1936)] was used for the preparation of all handsheets, because it allows sheets to be made under conditions which resemble more closely machine operations, and because preliminary work showed that sheets could be readily duplicated on it. The procedures given by Coghill were not followed exactly, but they were practically the same with the exceptions that, with very slow stocks, less water than normal was used in order to secure drainage in a reasonable time and that heavy sheets were not dried in contact with the wire upon which they were formed.

In certain experiments the sheets were calendered by the use of Noble and Wood press rolls by reducing the clearance to zero. Both the number of passes at a given pressure and the pressure for a given number of passes were varied. All sheets were seasoned at 70 deg. Fahr. and 65 per cent relative humidity for at least 16 hours and tested under these conditions unless otherwise stated.

Tests for basis weight, caliper, bursting strength, and tearing strength on all sheets were carried out according to TAPPI Standard Methods. However, in the tear test, it was occasionally necessary to increase the capacity of the tester by the use of the supplementary weight provided with it. Tensile and strength tests were carried out

(*) A portion of a thesis submitted in partial fulfillment of the requirements of The Institute of Paper Chemistry for the degree of Doctor of Philosophy from Lawrence College, Appleton, Wisconsin, June, 1939.

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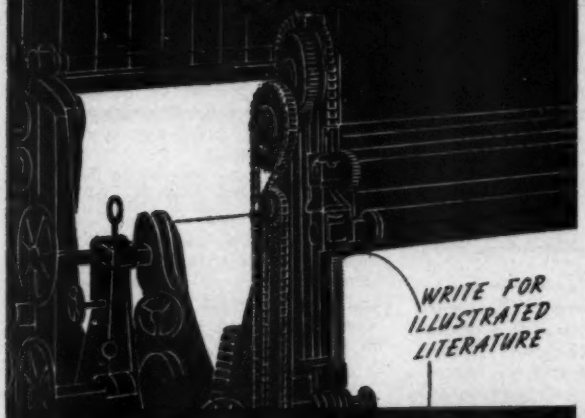

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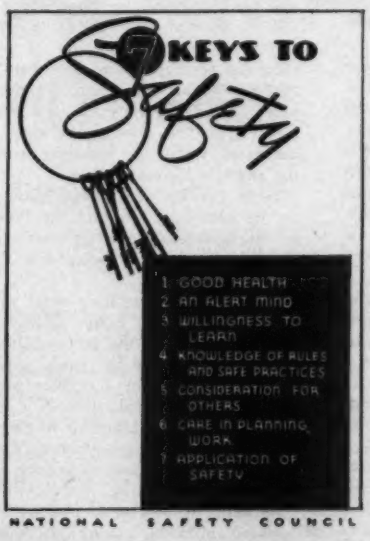

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TABLE "A"—Relation Between Handmade and Machine-Made Board

	Handmade	Machine-made
Weight	88.7	85.0
Caliper	29.0	28.5
Mullen	179.0	161.0
Tear	9.7	6.4*
M.I.T. Fold	664.0	240.0**
Riehle	40.7	49.6**
Tensile	53.6	56.8**
Tear Split	18.4	34.3**
Perpendicular Bonding	21.4	32.8

*In-direction only
**Average of the in- and across-direction

TABLE "B"—Effect of Adhesive on Perpendicular Bonding Tests

	Handsheets		Machine
Adhesive	Heavy	Light	Sheets
Glue (10 min.)	36.8	.....	.....
Glue (20 hr.)	93.7	51.9	28.8
Silicate (10 min.)	39.7	.....	.....
Silicate (20 hr.)	72.4	67.9	31.2
Dennison Wax	85.8	85.1	.....
Formulated Wax	.....	.....	34.8

on an Amthor tensile tester. Measurement of stiffness was made with a Suvant tester. Riehle stiffness is different from that measured by the Suvant instrument in that it measures the resistance of the sheet to crushing rather than to bending. This test was carried out on strips one-half inch wide and two inches long, with the crushing force being applied against the long edge of the sheet held in the form of a cylinder. The M.I.T. folding endurance was measured according to Institute Method 513B.

The tests in which the bonding between plies was measured by tearing the sheets apart in the splitting operation have been designated as tearing-type bonding tests. Three tests of this nature were carried out in evaluating the bonding between plies in the present investigation. The tester designed by Courtney and Wakefield [*Ind. Eng. Chem.* Anal. Ed. 6:470-473 (1934)] and modified by Forman [*Dissertation*, Inst. Paper Chem., 1936. 87 p.] was used in part of the investigation. In any test measuring the tearing split, the length of the split must be sufficient to make negligible the effect of the inserted strip or the starting of the split. The maximum and average forces obtained from the curve which results with the Forman tester are the better means of measuring the bonding with this instrument. However, the evaluation of the results is time-consuming, especially since a large number of tests are required to obtain a good average value. On account of this difficulty, a Schopper tensile tester, which would measure a force between zero and 1000 grams, was used to measure the tensile force required to tear the sheets apart. The split was started by means of the inserted strip, the two sides of the strips fastened into the clamps and the tensile force applied. The initial force, as well as the maximum force required to split the sheet, could be determined. However, this test was not very satisfactory, principally because it was not sensitive enough and the variations for any one sheet were quite large.

A method of measuring the integrated force required to split a definite area of the sheet with the Elmendorf tear tester was also used. Strips one inch wide and with a splitting length of up to 3½ inches can be used. After the split was started, the heavy side of the sheet was clamped in the front jaw of the tester, with the long axis of the sheet perpendicular to the plane of motion of the sector—i.e., the sheet extended to the front. The other side of the sheet was held in the fingers, or a suitable clamp, the pendulum released, and the sheet split apart. Due to the simplicity of the test and the possibility of securing consistent results with it, this test is recommended for all bonding measurements when it is desired to measure the bonding force between any two given plies and not the weakest force in the sheet.

A perpendicular or normal bonding test similar to that used by Abrams was employed in the present investigation to measure the force required to split the sheet (either a solid or a multi-ply sheet) when the force is applied normal to the surface. This test measures the weakest point in the sheet. The adhesive used in this test depended on the nature of the sheet; if it were a well-beaten sheet, animal glue was used to obtain a strong enough bond between the sheet and the block. Silicate was generally used, however, because it is sufficiently adhesive to be suitable for all commercial boards and does not penetrate sheets of the porosity encountered in this study.

In order to establish a basis of comparison between handsheets and machine-made sheets, six-ply handsheets were made from the same stock that was being run on a six-cylinder commercial board machine making 85-pound kraft-lined chipboard. Table "A" shows the relation between the handmade and machine-made sheets. The data contained in this table show that the strength of the handsheets made in the laboratory approximates that of a machine-made sheet. The largest variations are in the two bonding tests, but such a difference between the two sheets could have been reduced by using a more suitable relation between the couching and final pressures in the preparation of the handsheets.

The tear split and the perpendicular bonding tests showed good agreement in measuring the bonding force with changes in the amount of pressing. The tearing-type splitting test (using the Forman tester) indicated a maximum in the bonding between two plies, occurring at a relatively low pressing force—namely, about 40 pounds per inch. It was at approximately this pressure that the perpendicular bonding and the tear split test began to flatten off with respect to increasing pressing force. However, the latter tests did not show the maximum in the relation between the bonding force and the pressing that the Forman tests did. It is believed that the maximum obtained with the Forman tester resulted from some characteristic of the instrument itself; perhaps the angle which the sheet assumes as it is being torn apart causes the maximum effect.

The effect of the adhesive on the results obtained using the perpendicular bonding test was determined for thin and thick two-ply handsheets made from the same unbleached sulphite stock and in the same manner, as well as for the commercial kraft-lined chipboard. The results obtained with the following adhesives are reported in Table "B."

a) Animal glue, 27 per cent in water.
b) Forty per cent solution of sodium silicate.
c) Dennison No. 20 pick test wax.
d) Carnauba-beeswax, 2 to 1.

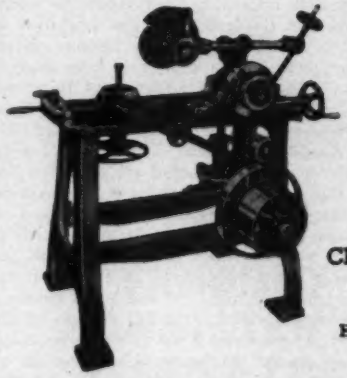
The nature of the adhesive and the method of its application have a marked effect on the perpendicular bonding test. However, differences are not due so much to the adhesive material itself as to the medium containing the adhesive, e.g., water, and the method of preparing the cemented sheets for testing. The time of seasoning after the sheets are cemented between the blocks with an adhesive containing water plays one of the most important roles in the test, for the bonding between plies is decreased when the moisture content of the sheet is increased.

It is possible that, when glue is used as the adhesive in testing the bonding in a thin porous sheet, it may penetrate through the sheet, bridging over the space between the blocks.

A hard nonpenetrating wax would be more suitable than either silicate or glue as the adhesive in the perpendicular bonding test if it could be evenly applied, because it would not introduce any water into the sheet. Application is a real difficulty, however, and asphalt of proper consistency has been recommended. Where silicate is used adequate seasoning must be allowed before testing.

In order to determine whether the bond between plies in a multi-ply sheet plays any part in the strength tests carried out on the sheet, the relation between the strength of multi-ply board and the strength of the individual plies that make up that board was determined. The stock used in the series of tests, was unbleached sulphite with a freeness of 620 cc.

From these data it appears that an appreciable part of the strength of a multi-ply sheet comes from the bonding between plies, probably the result of the greater



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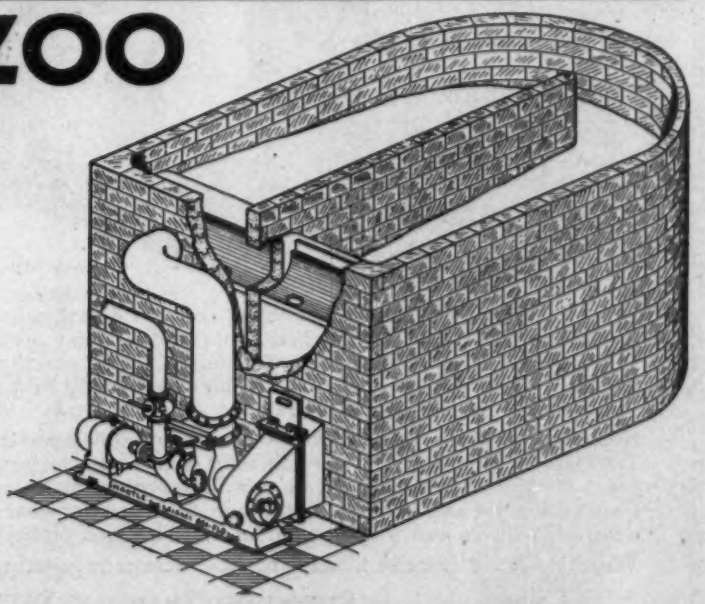

Illustration courtesy of Shartle Brothers Machine Company, manufacturers of the Shartle Agi-flo Pump

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WOOD

stiffness that exists for plies bonded together and the consequent transfer of the stresses throughout the mass.

Of the several stocks used to determine the effect of the number of plies on the bursting strength, almost all show a point between three and five plies where the Mullen reaches a maximum. The location of this maximum will vary with the over-all weight of the multi-ply board and the nature of the stock being used.

The bonding results obtained with both the tearing-type splitting test and the perpendicular bonding test require some explanation and clarification. The data serve to illustrate the introduction of weakness into the sheet as the number of piles is increased. In the two-ply sheet, where water removal need not disturb the bonding between plies, the bonding force is high, being very nearly that which existed between the fiber in the individual plies. As more plies were introduced, the water removal caused a disturbance of the bond between plies, so that the bonding at the weakest ply interface was not nearly as great as that between the fiber in the plies, although it may have been so at other interfaces in the sheet.

The tear values obtained on the Elmendorf tear tester showed a tendency to increase as the number of plies was increased. This may be attributed to increased splitting inside the sheet during the tear when there are present more interfaces that can be split apart as they are torn across. However, tearing strength of the multi-ply sheet is independent of the number of plies.

Multi-ply paperboard possesses one fundamental difference from laminated material. In the latter case, the lamination is carried out by cementing together sheets that possess approximately the same strength per unit weight irrespective of thickness, while the adhesive used is different from the sheets themselves. In the case of multi-ply board, conditions of forming the plies that make up the board are such that the nature of the plies changes as the thickness changes, due to changes in the quality of formation of the plies. At the same time, the material which cements the multi-ply sheet together is a part of the ply itself. In laminated board, the strength of the bond is usually greater than the strength of the ply, whereas this is the rare case in multi-ply sheets. Therefore, it is possible to have a point of maximum strength for each quality of stock and weight of sheet.

A study has been made of the bonding forces at all the different ply interfaces in various multi-ply sheets.

In general, it may be said that for any given stock or stocks, the bonding between two plies is dependent on their position relative to each other and with respect to the top and bottom of the sheet. The bonding is greater when the interface is between the top and middle plies in a three-ply sheet than when it is between the middle and bottom plies. The bonding is much greater if the freer sheet is on the outside of the interface. As the amount of beating of one ply in a three-ply sheet is increased (the other two being kept constant), the bonding between those plies increases until either the fibers in the freer sheet are bonded together with a force that is less than that at the ply interface, or until the variable ply has been beaten to such an extent that the removal of water across the interface in question is so difficult that the bonding between plies is reduced by its removal.

Many of the changes which take place at the interface when the freeness of one ply is varied are a result of the differences in the amount and rate of water removal during drying and especially during pressing. The ease with which the water contained in the plies can be removed across the interface determines the final bonding.

The action which causes the bonding between plies to vary is not a change in the fiber itself but a change in the amount of actual contact area between the plies. Any action that will decrease the actual area of contact will decrease the bonding between plies; any action that will increase the amount of contact will increase the bonding between plies.

The more water there is present in the sheet when the plies are being pressed together, the greater will be the freedom of motion of the fibers on the surface at the interface during pressing.

It is the final pressing of multi-ply sheets that causes the real bonding between plies to take place. The drying of the fibers that are in contact as a result of the pressing completes the cementing of the fibers and plies together. However, too rapid a drying action may cause this bonding to be reduced because pockets of steam may form under certain conditions.

As the sheet goes through the press rolls the fibers may be said to flow at the inter-

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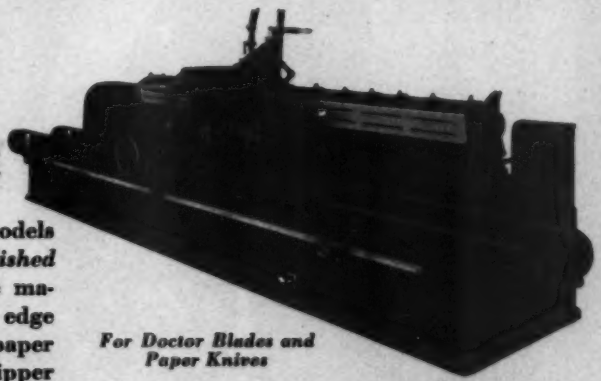

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face; the more water present, the more the fibers will move to fill in the interfaces between the two surfaces, thus producing a more nearly continuous structure. The higher the pressure used, the more the fibers will be pressed together in intimate contact, with the result that the bonding force is greater due to a greater area of actual contact.

The positions at which plies of different freenesses are placed greatly affect the amount of curl which a sheet will exhibit. The curl is always toward the ply made from the slower stock, and when this stock is greatly different from the others, the sheet may curl until it is in the form of a cylinder. If the ply with the greatest shrinkage is in the center of the sheet, it will tend to remain flat. It is usually believed that the curling of commercial board is caused primarily by the moisture content of the board across its surface. This may be the case if it is considered that the amount of "hydration" given a stock by beating helps to control the hygroscopic nature of the sheet. However, the primary factor that causes a board to curl is the amount of shrinkage each ply undergoes when the sheet is dried. If all plies shrink alike, the sheet will not curl.

Several different stocks were used to study the effect of couching pressure on the bonding between plies and the strength of multi-ply board. The stocks used included unbleached sulphite at different freenesses, unbleached kraft, and news—10 per cent unbleached sulphite.

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For all stocks, increasing the couching pressure caused an increase in the Mullen strength of the six-ply sheets, the rate of increase becoming less at the higher pressures, so that the type of curve was very similar to that obtained on beating stock. Increasing the couching pressure will either increase or decrease the bonding between plies, depending on the nature of the stock. In either case the change will be small. The bonding between plies of a relatively well-beaten stock decreases little as the couching pressure is increased, whereas that between plies of relatively unbeaten stock shows a tendency to increase.

For all stocks and at all freenesses, increasing the final pressure increased the bonding between plies, the rate of increase being greater at the lower pressures, with the bonding approaching a constant value at the higher pressures. This constant value is reached at a lower pressure if the stock is fibrillated than if it is a coarse stock. This is reasonable, because the coarser stock depends primarily on the effect of pressure to give sufficient contact between plies so that good bonding may result. For stocks that are relatively well beaten, the optimum amount of pressure required to bond the plies together is quite low (approximately 40 lb. per linear inch).

In general, an increase in the amount of final pressure results in an effect very similar to a *small* amount of beating. However, there is little change in the strength characteristics of the sheet brought about by the use of a pressing force greater than approximately 50 lb. per linear inch.

Some preliminary work indicated that calendering of multi-ply sheets decreased the strength and bonding to an appreciable extent.

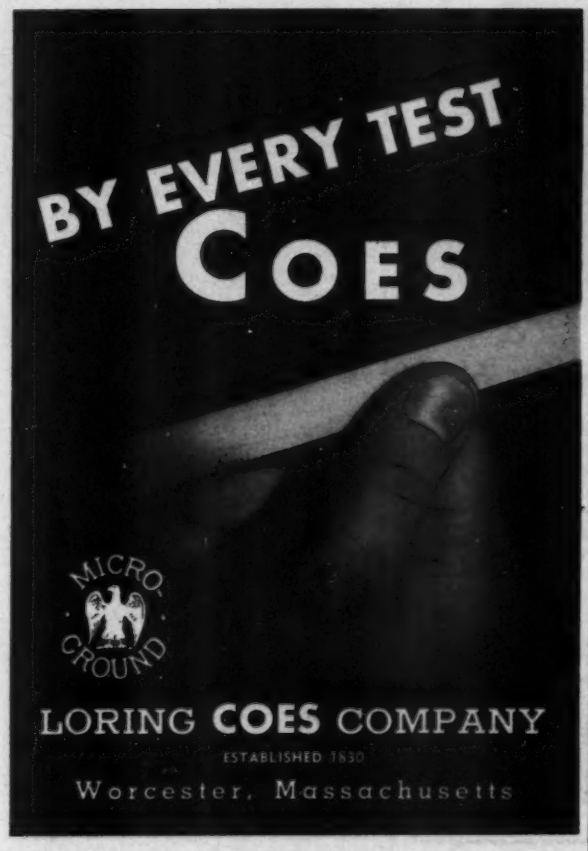
A more complete study was then undertaken to determine the effect of calendering on sheets of unbleached sulphite. The sheets used were 64-pound, two-ply sheets made from stock with a freeness of 620 cc. The sheets were couched with a force of 3.3 and pressed with a force of 66.7 pounds per linear inch. Both the calendering pressure, using 4 passes, and the number of passes at a pressure of 112.5 pounds per inch were varied.

For any given caliper and finish, reducing the amount of calendering that it is necessary to give a board improves all the major properties of the sheet.

Work was carried out to determine the effect of the moisture content of the final sheet on the bonding and strength tests, both at the moisture content at which the sheet left the drier and after it had been allowed to come to equilibrium with air at 70 deg. F. and a relative humidity of 65 per cent. It was carried out on a series of sheets made from unbleached sulphite with a freeness of 585 cc., couched at 3.3 and pressed at 66.7 pounds per inch. The sheets to be tested at the moisture content at which they left the drier were placed in sealed containers and taken out just before testing.

Apparently both the amount of drying and the moisture content of the sheets at the time of testing have an effect in determining the strength properties and the strength of the bonding between plies in a multi-ply sheet.

As the amount of moisture in the sheet



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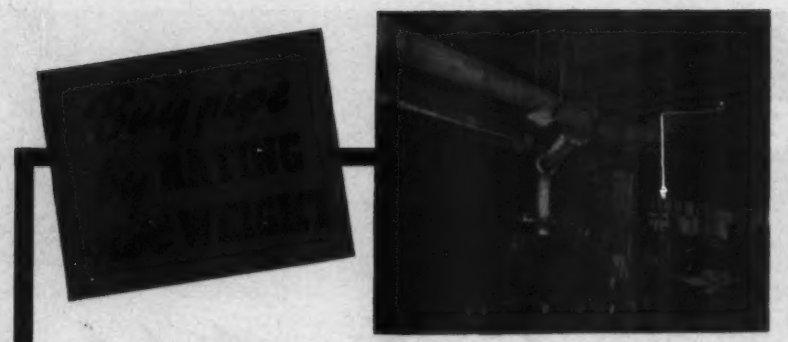

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is reduced, the bonding between plies, as measured by both the perpendicular and the tear split tests, increases regularly by an almost linear relationship. On the other hand, when the sheets are allowed to come to the same equilibrium moisture content, the bonding between plies is found to be slightly lower for the sheets that have been dried the most. Drying the sheets too much causes a reduction in the elasticity of the cementing structure between the fibers and plies. If the moisture content of the sheets is maintained very low, the result of the hardening action is to increase the strength of the bonding between plies. This is also observed in the strength of the bond between fibers, for the tensile strength of the sheet continues to increase as the sheet becomes drier. On the other hand, the Mullen shows a point of maximum strength, but this maximum is caused by the decrease in stretch of the fibers and not the bonding between plies of fibers.

As the work progressed, it became apparent that the amount of beating given a stock plays a very important role in determining the strength of the bonding between plies. In fact, it appeared that beating could increase the bonding to a very large extent. Therefore, the effect of beating on both bleached and unbleached sulphite and the effect of milling in a pebble mill on the unbleached sulphite was determined.

On the basis of the idea that any treatment that increases the actual area of contact between plies will increase the strength of the bond between them or that for the same amount of bonded area the force is always the same, it may be said that beating makes possible a greater area of contact between plies and, therefore, causes a higher bonding force to exist between them but does not change the force which holds a given area of contact together. The manner in which beating increases this bonding is very similar to that by which the bonding between fibers inside the plies increases with beating.

However, when the beating has been carried past a certain point, any attempt to split the two plies results in the sheet splitting inside one of the plies rather than at the interface between plies. The freeness at which this type of splitting takes place is dependent on the kind of stock and the nature of the beating action; it is at a freeness of about 400 cc. for unbleached sulphite beaten in a laboratory beater.

To explain the splitting inside of the ply, it is necessary to return to the idea of the three fundamental strengths which exist in a multi-ply sheet. The bonding between plies and fibers is equal when both plies are made from the same stock. Therefore, for the plies to split rather than the bond between them, the third strength; namely, that of the fibers themselves, must be the weakest strength in the sheet and the one measured by the perpeniuclar bonding test. The bonding between plies increases with beating until it is greater than the strength of the fiber itself. Beyond this point, the bonding between plies and fibers continues to increase, but the over-all strength of the sheet becomes less, due to the decreasing fiber strength. If the fibers are allowed to retain more of their original strength (by rod milling rather than

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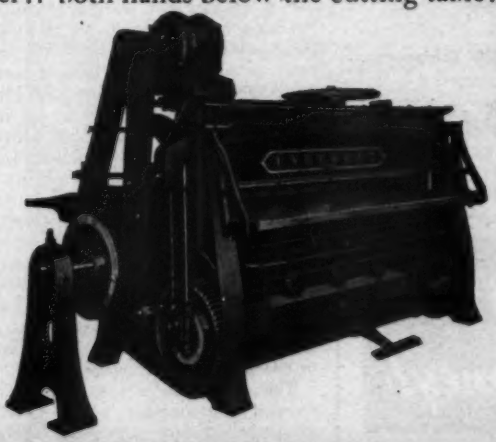

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beating the stock), the bonding between plies can be increased to a greater value before it exceeds the strength of the fibers.

A consideration of the relation between the Mullen strength and the bonding between plies shows a close correlation. The Mullen strength is dependent on the tensile strength of the sheet, and this in turn is dependent on the weakest strength in the sheet. At the beginning of the beating, the bondings between fibers and plies are the weakest strengths in the test strip, but as the amount of beating is increased the bonding becomes greater and the strength of the fiber less, until a point is reached beyond which the fiber strength is the weakest strength in the test strip. Therefore, the Mullen strength is governed by the strength of the bond between plies and fiber up to the point where it reaches a maximum. Beyond the maximum, the Mullen strength is dependent on the strength of the fibers.

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JOHN F. INDERDOHNEN, Engineer
The Bristol Company

Recording thermometers of the bulb and tubing pressure actuated type having vapor tension, gas and mercury filled systems have been in use for more than thirty years to guide the cook in digester operation.

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As a wall or panel mounting instrument it is interchangeable in appearance and mounting with standard recording pressure gauges, flowmeters and thermometers. It is also available as a portable model with carrying handle and adjustable feet and is supplied with a large indicating dial at the top so as not to interfere with the reading or changing of the recorder chart.

This potentiometer can be used in any location or mounting where a standard gauge or capillary connecting tubing and bulb type of thermometer is feasible. It is more convenient where long lengths of thermometer tubing would be required, as wire leads are used between the thermocouple or resistance bulb sensitive element and the instrument. The sensitive elements and leads are easily repaired or separately replaced if damaged mechanically or by corrosion.

It is ideal where a restricted temperature range is desired, being available in ranges as low as 20 deg. Fahr. across the scale, or such as 130-145 deg. C. across the chart.

The instrument is also made as a multi-pen recorder, either with two potentiometer temperature recording systems or with temperature and pressure recording pens on the same chart. Hand switches are supplied on some installations to permit checking or recording from any of several stations.

The single pen recorder has generally been furnished as a resistance thermometer with a range of 50-150 deg. C. The bulb is furnished in a closely fitted stainless steel socket for installing in the digester.

Many mills prefer the 2-pen recorders, with one bulb near the bottom and one at the top of the digester, for a closer check of operating conditions. This potentiometer makes possible installation of four or more bulbs in a series-parallel circuit. Connected through a manual switch they can be read individually or their average temperature recorded on the chart.

Another possibility is the double range instrument where one scale would cover the entire cooking range from room temperatures or below to 150 or 160 deg. C., and an additional pen would give magnified readings to cover the whole chart scale with a range of 130-150 deg. C. for extra close readings.

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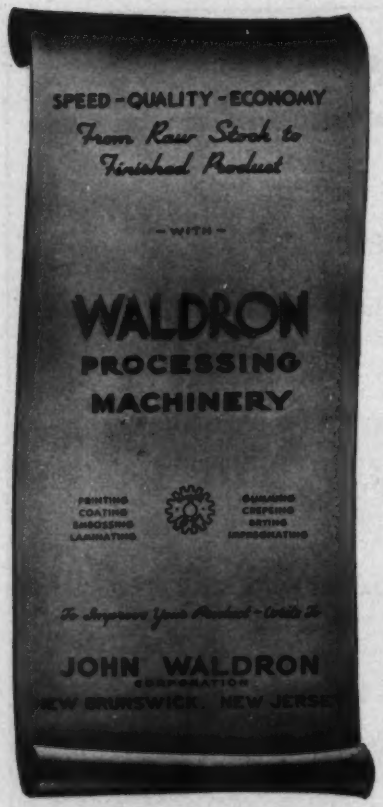

mometer is used. The sensitive bulb is placed either in the circulating liquor line at the outlet of the heater or in the base of the digester in the path of the entering circulated liquor.

The associated control mechanism and the readings of the potentiometer maintain a control of the liquor temperatures exactly as specified for the digester requirements.

Results from installations show these new potentiometer recorders and controllers to be particularly suited for controlling sulphite digester temperatures where maximum sensitivity and accuracy are desirable, especially for the production of uniformly highest quality pulp.

Decreased Felt Life Due to Bacterial Action

JOHN P. WEIDNER, Research Chemist
Hoberg Paper Mills

Ten years ago it was found that by treating the felt shower water, it was possible to increase felt lite by fifteen per cent under certain conditions. More recently, it was shown that chlorinating felt water gave increased felt life.

Methods have been tried to treat the wool before felt manufacture, but they have not been satisfactory, since in the processes which have been used, the water absorbing power of the wool was modified. However, it was thought that the felts could be treated after they were made and on the paper machine.

Definite methods of treating felts alone and the results that could be expected have not been available, because each mill has its own particular problem and because no universally applicable method has been advanced and tested. The method described in this paper is applicable to all felts on the paper machine, needing only variation in the amount of agent depending on the size of the felt.

Three types of materials were tried as treating agents, namely, Dowicides B, C, and G. These are chlorinated and phenylated phenols. A definite amount of these materials, either two or four pounds, was dissolved in fifty gallons of water and this solution thrown onto the felts at the entering side of the press. It was proposed to try first, one application each week on the shut down, and more frequently, if necessary, while the machine was down during the week. The solution was thrown onto the felt just before stopping the felt section, after the wash-up at the end of the week, in such a manner that a pool of liquid formed behind the press and both felts became thoroughly saturated.

The necessity for some kind of treatment to reduce felt destruction by bacteria first became apparent when pick-up felt life on one Yankee machine decreased from an average of 600 hours to from 190 to 500 hours, with no apparent mechanical cause. On another machine running with a single felt, life decreased from 160 hours to as low as 80 to 100 hours.

As far as wet felt life is concerned, all actual running life increased, and the increase was very nearly the same, no matter which agent was used.

An increase in wet felt life of ten to fifteen per cent and as high as forty to sixty per cent can be expected by treating with antiseptics once a week under various conditions. For top or pick-up felts, the increase may be ten to one hundred per cent, depending on the actual mill conditions. These increases were accomplished during the months of May through November, as compared to averages for no treatment from January through April. Hence, the gains were accomplished during the most favorable months of the year for bacterial activity.

In November and December treatments were discontinued on different machines. Treatments were discontinued for one reason, to see how effective and how necessary treatments were during the winter months. At the present time there has been no recurrence of the holes and cracks However, some felts have shown very short evidencing serious bacterial destruction. life.

EDITOR'S NOTE: Succeeding issues of this magazine will contain further installments of abridgments of papers presented at the annual meeting of the Superintendents Association held in Cincinnati, Ohio, in June; also the fall meeting of the Technical Association which was held in Seattle, Wash., in August. The first installment of abridgments of the TAPPI fall meeting papers appeared in the September issue; the Superintendents Association abridgments were published in the July, August and October issues.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of The Paper Industry and Paper World, published monthly at Chicago, Illinois, for October 1, 1940.

State of Illinois, County of Cook, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared A. Scott Dowd, who, having been duly sworn according to law, deposes and says that he is the business manager of "The Paper Industry and Paper World" and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Fritz Publications, Inc., 59 E. Van Buren St., Chicago, Ill.; Editor, Besse Merrithew, 59 E. Van Buren St., Chicago, Ill.; Managing Editor, Harry E. Weston, 59 E. Van Buren St., Chicago, Ill.; Business Manager, A. Scott Dowd, 59 E. Van Buren St., Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given). Fritz Publications, Inc., 59 E. Van Buren St., Chicago, Ill.; Mrs. Annie C. L. Fritz, 6801 S. Crandon Ave., Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is.....
(This information is required from daily publications only.)

A. SCOTT DOWD
(Signature of business manager.)

Sworn to and subscribed before me this 25th day of September, 1940.
[SEAL] THOMAS H. STEVENS, Notary Public.
(My commission expires June 24, 1943.)

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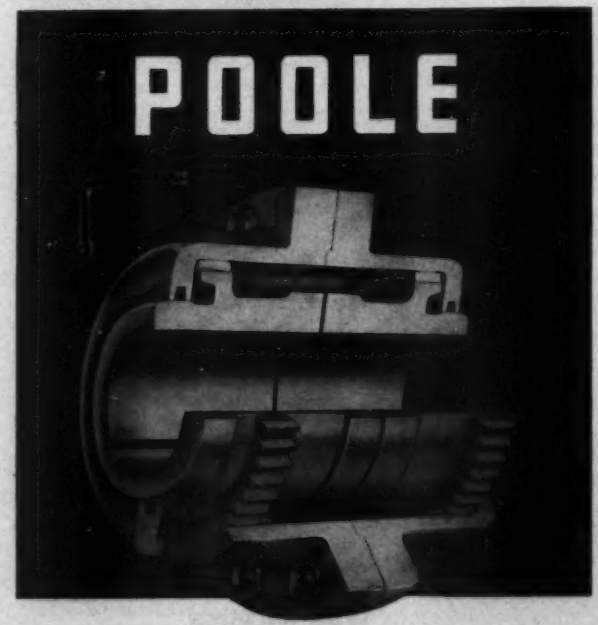

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NEW EQUIPMENT AND SUPPLIES

Paper Temperature Comparator

Perfecting Service Corporation, 2622 South Parkway, Chicago, has announced the development of an instrument for comparing the temperature of an unwrapped load of paper with room temperature. The instrument, known as *Paper-Temp*, is a lance-pyrometer. Thermal contact is in extreme point of bayonet. The bayonet is demountable for convenience in transportation. Indicator range is plus or minus 100 degrees from room temperature. By setting the indicator at zero by means of a push-button adjuster on the outside of case,

at the time of making a test, the instrument shows whether the load of paper is colder or warmer than the room, or whether paper and room temperatures are in balance.

Proportioning Equipment for Corrosive Fluids

Cochrane Corp., 17th and Allegheny Ave., Philadelphia, has announced an air-actuated proportioner for accurate feeding of sulphuric acid in the conditioning of boiler feedwater and for the proportioning of any corrosive solution, such as aluminum sulphate, ferrous and ferric sulphates, etc., to the rate of flow of another liquid. A contact meter in series with a cycle controller operates an air compressor inside

the proportioner shell when a predetermined flow is reached. The acid or other corrosive fluid is measured into dilution tank to which water or other liquid is proportioned by a simple, accurate mechanism that prevents abnormal chemical concentration, either too high or too low. A special feed-line fitting provides for diluted acid or other fluid entering the main flow.

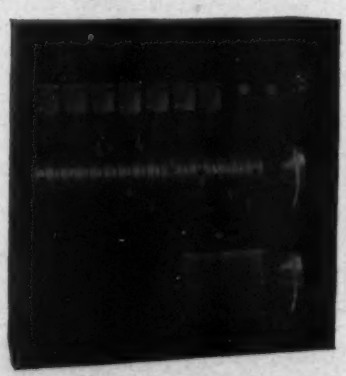
Proportioning Pump

Milton Roy Pumps, 3160 Kensington Ave., Philadelphia, has announced a high pressure, high capacity, duplex proportioning pump. This pump, according to the manufacturer, can handle up to 1200 gallons per hour.

Time-Cycle Controller

Taylor Instrument Companies, Rochester, N. Y., has announced a time-cycle controller, the *Flex-O-Timer*, which is adaptable for all-electric or all-pneumatic operations, or combinations of both. A new latch-trip solenoid operated mechanism starts the process instantaneously. This actuates one or more snap operators to start the timer motor which is of the high torque, fan cooled synchronous type, and any outside electrical or pneumatic functions to be performed simultaneously at the start of the cycle. An external push button or limit switch can be used to provide the electrical contact to start this process.

Flexibility is obtained by the use of adjustable pins on a revolving drum. The pins are adjusted in circumferential under-



cut grooves on the one-piece drum and locked in place with a screw.

The drum is run directly by a spur gear train, but a dog and latch mechanism provides 78 different drum speeds with each gear train ratio. Yet the drum speed is fixed and positive for any given setting and can vary only as the frequency of the electrical supply changes. Models also are available with a fixed speed gear train.

New Titanium Pigment

R. T. Vanderbilt Co., Inc., 230 Park Avenue, New York City has announced the development of an improved titanium pigment. This pigment, designated as the new *Rayox* is the result of Vanderbilt research toward increasing the efficiency of *Rayox* in papermaking.

Originally Rayox had an agglomerate content in the range of 0.3 per cent to 0.8 per cent. The new *Rayox* shows an agglomerate content approximately one-tenth of the old figures. Likewise, formerly, *Rayox* in a four-hour suspension test, showed a suspension of approximately 85 per cent. The new *Rayox* shows a suspension of approximately 95 per cent.

The reduction in agglomerate content of the new *Rayox* as contrasted with the former product, according to the manufacturer, is sufficient to produce a marked increase in smoothness, brightness and gloss when the new product is used in coating, the dispersed particles yielding greater optical value than aggregates when present on the sheet. The manufacturer also states that a similar increase in efficiency is obtained when the new *Rayox* is used in filling because better dispersion results in higher retention of pigment by the fibers and in greater opacity in the sheet.

Photomicrographs of Old Rayox Compared with New Rayox

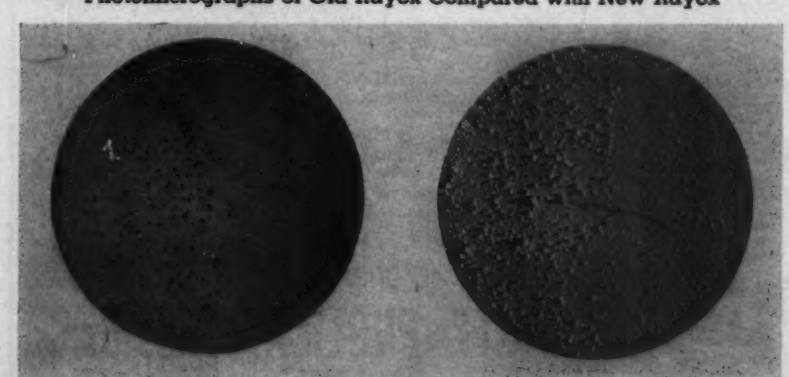


Fig. 1 (left)—Transmitted light. Fig. 2 (right)—Incident light. The left side of each of the above photomicrographs shows the old Rayox; the right side, the new Rayox.

Floor Repair Material

A waterproofing, crack-filling and splinterproofing material for wood or concrete floors has been announced by Rock-Tred Co., Inc., 629 West Washington St., Chicago. The manufacturer states that the material, designated as Tred-Seal, provides a non-slip, dustproof, long-wearing surface which acts as a floor preservative; that it is easily applied with a steel trowel; and that it is ready for heaviest service in six hours.

Enamel Paint for Damp Wall Surfaces

Wilbur & Williams Co., Boston, has announced an enamel paint for application on damp walls. The product, designated as *Dampcoat Enamel*, has such capillary attraction for damp surfaces and such penetrating power, according to the manufacturer, that it lifts the surface moisture to the top of the enamel film, allowing the enamel to dry as under normal conditions.

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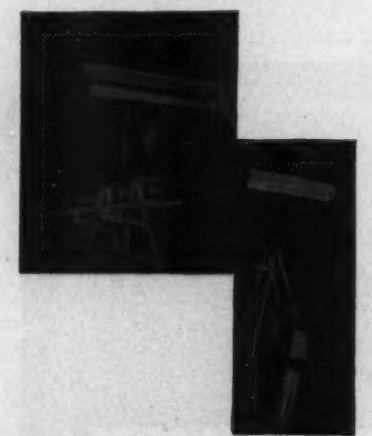
Portable pH Meter

A self-contained *p*H meter, sensitive to .005 *p*H and which reproduces readings to .01 *p*H, has been announced by Cambridge Instrument Company, Inc., Grand Central Terminal, New York, N. Y. This instrument is designated as the *Cambridge Electron-Ray pH Meter*. It is housed in a case 8½ in. x 10 in. x 17½ in.; weighs 25 lb.;

utilizes a glass electrode; and operates from any convenient 110 volt a.-c. outlet. An electron-ray tube indicates the balance point. This tube is practically immune to damage from mismanipulation. A millivolt scale enables direct reading of oxidation-reduction potentials. The range of the instrument is 0 to 14 *p*H and 0 to 1200 millivolts.

Fluorescent Fixture with Removable Reflector

The Edwin F. Guth Co., 2615 Washington Ave., St. Louis, has announced the development of a fluorescent lighting fixture



with a removable reflector as an aid to better maintenance. The reflector, removed by unscrewing two knurled nuts, is made of Alzak processed aluminum; the outer housing of rust-protected, heavy gauge steel. High power factor lamp control and starter switches are secured in the housing. The unit is designated as the *Utility Flu-O-Flector*.

Rubber Compounds with High Electrical Conductivity

Compounds of natural ruber and synthetic rubber with a high degree of electrical conductivity have been developed by laboratory research chemists of The B. F. Goodrich Company, Akron, Ohio. Solutions of synthetic rubber can be furnished for paint-like application to surfaces of natural rubber for carrying away static. For conducting static, a certain amount of resistance is desirable, since it prevents sparking. The specialized compounds, both in synthetic and natural rubber, allow the amount of resistance needed to remain in the material.

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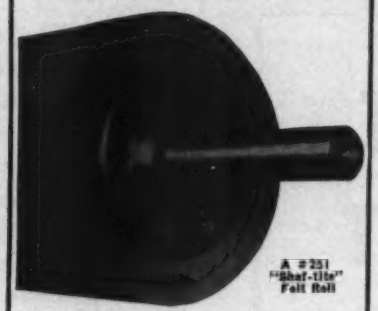

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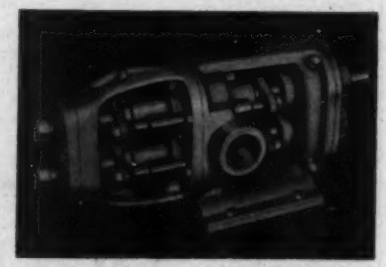
Hand Lift Truck

The Yale & Towne Mfg. Co., Philadelphia, has announced a hand lift truck, the *Transliftor*, which is made in capacities from 3,500 to 5,000 lb. and which is available in either wide or narrow frame models.

Designed for use with skid platforms, the truck features hydraulic release checks to prevent dropped loads and torsion type rear links for side sway elimination. The truck also is provided with a positive mechanical selective (pump action) lift.

Paper Mill Pump

Bump Pump Company, La Crosse, Wisconsin, has announced the development of a pump that has been made especially to meet paper mill requirements. According to the manufacturer, the pump is posi-



tive in its action; will handle acids, coating materials, pulp, water, condensate from dryers, etc.; and is made in sizes for every plant requirement. It also is claimed that the pump can be quickly and easily cleaned; and that it is economical in operation.

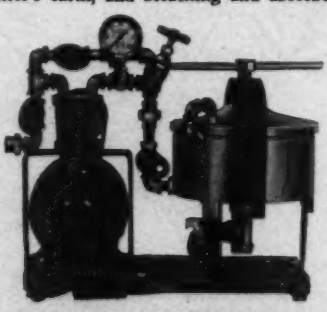
Non-Skid Overshoe

Industrial Products Co., 809 W. Somerset St., Philadelphia, has announced a non-skid

white rubber industrial overshoe. The sole is specially designed to give a combined suction-squeeze action.

Laboratory Filter

A laboratory filter of the horizontal plate type has been announced by Sparkler Manufacturing Co., 1210 Webster Ave., Chicago. The filter is designed to permit the use of various filter media, such as diatomaceous earths of all types, activated carbons, filter or wire cloths, asbestos, fuller's earth, and bleaching and absorbent



clays. Construction consists of three horizontal plates, 8 in. in diameter, mounted in a cylindrical filter tank with single clamp cover. The equipment is made in iron, aluminum, bronze, Monel, and stainless steel. The filtering area is one square foot with a cake displacement of 144 cu. in. The unit is equipped with a ¼ hp., 110 volt motor.

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TECHNICAL DEVELOPMENTS

The following abstracts are of the latest developments found in the foreign press.

The Influence of Age on the Grinding of Pine Wood

Pine wood of various ages was used, (30, 50, 70 and 90 years old). A factor which signally influences quality of pine groundwood is the per cent heartwood. In the wood 30 years old, this was only about 2%; in that 90 years old it was 46%. The rosin content in the heartwood increases with the age of the tree. In young trees (largely sapwood) the benzol-methanol extract contains only fats, and the total extract from sapwood does not increase with age of the tree. There is no evidence of marked differences in the results obtained in grinding young (non-resinous) pine wood and on grinding spruce wood. However, after heartwood has once formed in large amounts differences were noted. Older specimens yielded inferior groundwood. Evidently this is caused by increased rosin content. On the other hand, the younger wood gave lower yields and suffered from greater losses on barking. The authors give tabulated data on the woods used, and detailed results of grinding studies (especially as compared with spruce). W. Brecht, H. Schröter, and R. Süttinger. Papier-Fabr. *38*, 77-9 (1940).

High Grade Papers from Short-fibered Hemp

A discussion of the possibility of substituting short for long fibered hemp in manufacturing high-quality papers, has led to a demonstration of the feasibility of such a plan. Small mills in various parts of the U.S.S.R. are proposed. These would take the short fibered hemp from plants already established, which work up hemp for various other purposes. The best fibers would be removed and the pure fiber supplied to the paper mills. P. Kokin and E. Fridman. L'no-Pen'ko-Dzhutovanya Prom. 8, No. 5, 12-16 (1938) through C. A. 34, 6448 (1940).

Sulphate Pulping of Water-Stored Wood

Experiments were made to determine the role played by water storage on wood which was to be pulped by the sulphate process. Numerous tables and graphs give the results. After such storage, the calorific value of the organic substances in the black liquor decreases. The yield of cellulose (pulp?) obtained from dry wood substance (after water storage) was higher than that obtained from wood that had not been stored in that way. This type of storage gives pulps having 10-14 per cent higher bursting strength, but 15 per cent lower tearing strength. Pulp isolated from water-stored wood is somewhat more difficult to beat or to defiber. Alkaline attack on such wood also presents some difficulties. The yield of methylene-chloride-soluble material decreased after storage. Eric Hägglund, Brynolf Brisman, and Torbjö Aberg. Svensk Papperstidn. *43*, 187-91 (1940) through C. A. *34*, 5656-7 (1940).

Diffusion of Air Moisture Through Paper and Cardboard

An experimental method for determining the diffusion constant is described. The experimental results agree with the calculated values. Smooth surfaces generally present greater resistance to diffusion than do rough surfaces. W. Lehmann-Oliva. Z. Ver. deut. Ing. Beiheft. Folge 1940, No. 1, 25-31 through C. A. 34, 7107 (1940).

Hydrogenation of Lignin

A lignin isolated from *Picea jezoensis*, by the use of HCl, contained 16.3 per cent methoxyl. This was methylated until the methoxyl content was 30.9 per cent. Then the original and the methylated products were then both hydrogenated at 260-70 deg. C. and 230 atmospheres, using the following catalysts:—nickel oxide, reduced nickel, chromium oxide, copper, ammonium molybdate, and cobalt sulphide. Of these the first named gave the most satisfactory results. Of the various solvents tried, dioxane proved the best. With this solvent, and nickel oxide, 40-44 grams of the original lignin absorbed one mole of hydrogen in 35-55 hours. Methylated lignin seems to lose its ability to react with hydrogen. An ether-soluble portion, after hydrogenation of the original lignin, amounted to 46.7 per cent of the weight of this lignin, and could be separated into the following components:—dihydroeugenol, protocatechuic acid, pyrocatechol, and *p*-hydroxybenzoic acid. Of these, dihydroeugenol is considered the primary product, and appears to have an important bearing on the constitution of lignin.

The other products seem to be the results of decomposition of dihydroeugenol. Aldehydes and other neutral substances were also found in the ether extract. Yosikazu Hatihama, Syo Zyodai, and Masao Umezu. J. Soc. Chem. Ind. (Japan) *43*, Supplementary Binding 127 (1940); through C. A. 34, 5655 (1940).

Tannin Interference in the Lignin Determination

The question of tannin interference in the analysis of plant materials was studied and a number of tannins were examined. They were classed in three groups, with a view towards determining whether interference is characteristic of any one group. Data seem to show that interference by tannins is more a question of degree than of the kind of tannin present. However catechol tannins interfered the most. Pretreatment with 5% sulphuric acid, far from removing extraneous interfering material, actually leads to a higher apparent lignin figure. If the material is boiled for 1 hour with water and subsequently hydrolyzed with dilute sulphuric acid to overcome interference of pentoses and proteins, the lignin figures fall within reasonable limits. Alcohol is suggested as a preliminary extracting agent since chlorophyll is a possible cause of interference in the lignin determination. Vegetable tannins therefore, as well as caffeine, and chlorophyll are agents which in green materials interfere with the accurate determination of lignin. There appears to be no relationship between tannin content and lignin. A superficial relationship between nitrogen and lignin requires further study. J. G. Shrikhande. Biochem. J. 34, No. 6, 783-9 (1940), through Bull. Inst. Paper Chem. 11, 18 (1940).

Relation of Cumarones in Beechwood Tar to Lignin

Two fractions of neutral oils from beechwood tar were investigated. They contained substituted cumarones. By preparing the zonides and decomposing them, aldehydes and acids of substituted salicylic acid were obtained. Their relation to the structural formula for lignin proposed by Freudenberg is discussed. A. v. Wacek and E. Nittner Cellulose chem. 18, 29-33 (1940) through Bull Inst. Paper Chem.. 10, 456 (1940).

Digestion by Steaming of Straws and Other Plant Materials

The raw materials used were straws, reeds, cornstalks, and bamboo. No chemicals were used, but the material was simply subjected to saturated steam at 152-158 deg. C. No shredding or fine division was resorted to. The author considers the digestion autochemical and in it mainly acetic and formic acids (together with traces of other aliphatic acids) are formed by hydrolytic cleavage. These acids serve to remove certain encrusting materials from fibers and nodes. The residue from this steaming, was refined in rod-mills, jordans, and beaters if it was to be used in paper or board manufacture. If it was to serve as cattle-feed, the refining was carried out in kollergangs. For paper pulp the yields were 60-75 per cent; for fodder, about 90 per cent. Factors influencing the process are:—moisture content of the original raw material and temperature of the saturated steam. If the moisture content is too low, actual charring may result. The "critical" steaming temperature is 160 deg. C. More time is required for the production of feed than for paper pulp. The latter can be used alone or in admixture with waste paper in making roofing, boards, etc. A description is given of an installation of commercial scale equipment. V. W. d'Obry. Zellstoff u. Papier. *20*, 67-70 (1940); through C. A. *34*, 5657 (1940).

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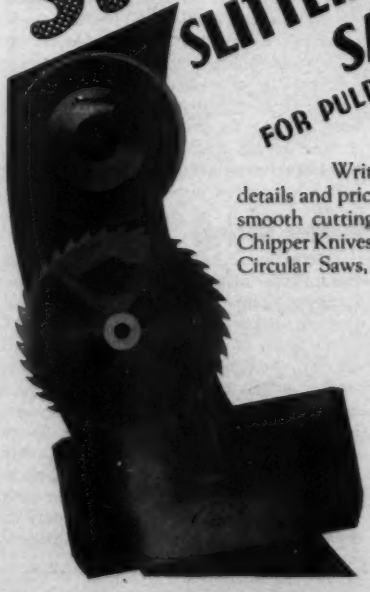

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PAPERMAKING PATENTS

IN THE UNITED STATES—Compiled by James Atkins, Registered Patent Attorney

Inquiries should be addressed to James Atkins, Munsey Building, Washington, D. C.

Apparatus for Continuous Treatment of Wood Pulp, Cellulose, and Similar Material with Bleaching Liquid, Alkali, or Other Chemicals

Patent No. 2,195,680. Johan Christoffer Fredrik Carl Richter, Oslo, Norway, assignor to Aktiebolaget Kamyr, Oslo, Norway. Application December 1, 1936, Serial No. 113,722. In Sweden December 9, 1935. 2 Claims. (Cl. 92—7). An apparatus for continuous treatment of wood pulp, cellulose and the like with chemicals such as bleaching liquid, alkali, or the like, comprising a substantially vertical U-shaped channel with large, substantially uniform unobstructed cross section and devoid of mechanical conveying devices, one section of the said U-shaped channel being provided at the top with means for supplying material and chemicals, the other section being provided at the side facing the first section with an overflow for continuously removing the material treated, said overflow being located substantially below the top level in said first section, a storing tank for the treated material formed by and being located in the space between the two sections of the U-shaped channel.

Paper Cutter

Patent No. 2,214,540. Charles C. Shackelford, West Monroe, La. Application September 29, 1938, Serial No. 232,473. 2 Claims. (Cl. 164—76). A web cutter comprising an elongated stationarily mounted tube having a slot extending longitudinally in the side thereof, a motor slidable longitudinally in the tube and having an armature shaft protruding through the slot, and a cutter carried by the outer end of the armature shaft, and an elongated rod extending into the tube and pivotally attached to the motor and adapted to move the motor longitudinally in the said tube.

Process of Coating Paper

Patent No. 2,216,143. William F. Thiele, Wisconsin Rapids, and Howard Brewster Richmond, Stevens Point, Wis., assignors, by direct and mesne assignments, of nine-tenths to Consolidated Water Power & Paper Company, Wisconsin Rapids, Wis., a corporation of Wisconsin, and one-tenth to Peter J. Massey, River Forest, Ill. Application May 11, 1936, Serial No. 79,048. 4 Claims. (Cl. 92—40). A method of producing coated paper having a uniformly smooth surface coated to render the same substantially opaque and to form a coated surface thereon suitable for the reception of printing which comprises, forming a fibrous web as a continuous operation, removing a portion of the water from the web by mechanical pressure, passing the web into heat exchange contact with a heated rotating surface, transferring a mobile coating material of relatively high solids content from a rotating surface to said web while the same is still wet substantially simultaneously with the initial generation of vapor in the web and before an appreciable amount of moisture has been driven from the web by heat, and carrying said coated web around said heated rotating surface to dry said web and coating in the form that it was originally applied to the web to a predetermined moisture content.

Bleaching Pulp

Patent No. 2,195,302. Clifford Allen Hampel, Niagara Falls, N. Y., assignor to The Mathieson Alkali Works, Inc., New York, N. Y., a corporation of Virginia. Application January 10, 1939, Serial No. 250,169. 3 Claims. (Cl. 8—105). In the high density pulp bleaching of cellulosic material by chlorites, the improvement which comprises activating the chlorite after formation of a high density pulp having a pulp density in excess of about 15% and containing the chlorite under inactive conditions by bringing into contact with the pulp a mixture of an inert gas and hydrochloric acid gas.

Apparatus for Beating Fibrous Stock

Patent No. 2,214,080. William A. Kelley, Milwaukee, Wis. Application January 2, 1937, Serial No. 118,743. 8 Claims. (Cl. 92—22). In a beater, a bed plate, a rotatable beater roll, means for supporting the roll for movement towards and from the bed plate, means for driving the roll, control means for maintaining substantially constant resistance to turning movement of the roll, said control means including means for moving the roll away from the bed plate as the resistance to turning movement of the roll tends to rise above said predetermined resistance, and for moving the roll towards the bed plate as the resistance to turning movement tends to fall below said predetermined resistance to turning, means for automatically terminating the beating cycle when the roll reaches a predetermined position in respect to the bed plate, said last-mentioned means including a member movable by the roll moving means to positions corresponding to the positions of the beater roll with respect to the bed plate, and stop means, operable by said movable member when the beating roll reaches a predetermined position in respect to the bed plate.

High Temperature Ironing of Fiber Weflap

Patent No. 2,217,691. William H. Mason, Laurel, Miss., assignor to Masonite Corporation, Laurel, Miss., a corporation of Delaware. Application June 13, 1939, Serial No. 278,818. 8 Claims. (Cl. 92—39). Process of making a skin-surfaced, porous fiber board, which comprises the steps of forming from a water bath a wet felted sheet of fiber of ligno-cellulose wood or woody material which fiber contains at least the principal part of the non-cellulose or encrusting fiber constituents and is self-bonding, then pressing surplus water from the wet sheet by passing it through between squeeze rolls, and then hot-ironing the sheet, so freed from surplus water, by passing it through between press rolls at least one of which is heated to a temperature varying with the speed and which for ironing press roll surface speeds of about 12 to about 100 feet per minute is from 250° C. to about 400° C., while applying pressure by the press rolls which does not exceed the pressure which had been applied by the squeeze rolls so as to avoid expression of water during the hot-ironing operation, said sheet expanding on leaving the press rolls, and then area-drying the skin-surfaced sheet, whereby a finished porous fiber board is produced having at least one thin-hot-ironed skin surface portion which is relatively compact, dense, smooth and impervious and does not extend therebeyond into the porous body of the board and is adapted for taking surface finishes as paint and the like.

Manufacture of Paper

Patent No. 2,216,845. Louis L. Larson, Hockessin, Del., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware. Original application September 28, 1936, Serial No. 103,049. Divided and this application July 6, 1939, Serial No. 283,089. 8 Claims. (Cl. 92—21). In the manufacture of grease-proof paper by a process involving as a continuous operation the standard successive paper making operations of pulp stock preparation, sheet formation, pressing and drying, the new steps which comprise mixing paper pulp with size solution containing as the film-former an alkali soluble cellulose ether from the group consisting of alkali soluble methyl celluloses, alkali soluble glycol celluloses, alkali soluble cellulose gycolic acids, and alkali soluble urea celluloses, precipitating said film-former on the paper pulp, applying to the sized fibers within the primary paper making operation before drying the sheet formed from the sized fibers an aqueous solution of an alkaline swelling agent which swells the precipitated film-former without parchmentizing the fibers, allowing the swelling agent to react until the film-former is in highly swollen condition, and before drying the sheet stopping the action of the swelling agent while the precipitated film-former is in a highly swollen state but before it has been dissolved to the sol state.

Paper Sizing

Patent No. 2,214,018. Lowell O. Gill, Decatur, Ill., assignor to A. E. Staley Manufacturing Company, Decatur, Ill., a corporation of Delaware. Application July 16, 1936, Serial No. 90,855. 2 Claims. (Cl. 92—21). In the formation of a paper web by the process which includes producing a beater suspension of fibrous particles and hydraulically depositing said fibres in the form of a web, the improvement which comprises combining with the beater suspension starch modified by frictional extrusion under sufficient pressure to physically distort the starch cells and to render the same dispersible in water without cooking.

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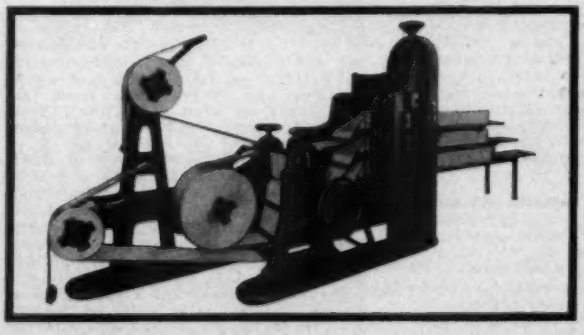

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New Catalogues and Publications

American Brake Shoe & Foundry Co., Chicago Heights, Ill.—This company's American Manganese Steel Division has just published a 24-page bulletin covering Amsco-Nagle industrial pumps "for pumping everything but clear inactive liquids." Interesting and helpful pump data are given together with characteristic curves and construction and installation views.

Buell Engineering Co., Inc., New York City—An attractive and informative new booklet entitled "Dust in Industry" has just been published by this company. The booklet, bound in a stiff, modern-designed covers, has two sections, Section 1 embodies general information on dust collection; Section 2 deals specifically with the van Tongeren Theory and its advantages. The book is planned to interest a dual audience; plant executive and engineer or technician. Considerable photographs are included in this well-laid-out and well-written offering.

Fischer & Porter Co., Germantown, Philadelphia, Pa.—A splendid new catalogue (10-A) on this company's Rotameters has been published lately. Included in this excellent release are numerous photos, diagrams and drawings which, together with the extensive written material, give a comprehensive story of the operating principles, design and uses of the product. Of special interest is the section of the book on the theory of the Rotameter which explains in detail, the actual principles of its design as developed by basic fundamental studies and research. The catalogue is spiral-bound and is well designed. It would find a place in any industrial library.

General Electric Co., Schenectady, N. Y.—Several new bulletins have been issued recently by this company. An interesting bulletin on the company's FK-142 oil circuit breaker (Bulletin 2165A) contains brief data and illustrations as to the construction and usages of the equipment. Ratings are given. Another bulletin (1755C) describes the G-E photoelectric relays and accessories while a third release (3434) has to do with high speed synchronous motors, "900 series." All these bulletins are illustrated and all are punched for looseleaf filing.

B. F. Goodrich Co., Akron, Ohio—A new handy-sized, 170-page "V-Belt Data Book" has been published recently. The book gives alphabetical listings of belt requirements for electric refrigerators, gasoline pumps, woodworking machines, stokers, air compressors, etc. These listings give the manufacturers' part number, the Goodrich belt number and its size in each case.

International Nickel Co., Inc., New York City—Three very informative bulletins have been released by this company. Bulletin T-2, revised as of June, 1940, contains technical information on welding, brazing and soft soldering of monel, nickel and inconel; Bulletin T-5 contains data on the engineering properties of monel and the third release, "The Working of S. A. E. Nickel Alloy Steels, as reprinted from *American Machinist*, is a 15-page publication on heat-treatment, characteristics, machining, etc., of nickel alloy steels. All three publications contain considerable data and specifications together with drawings, tables, charts, etc.

Kennedy Valve Mfg. Co., Elmira, N. Y.—A big, new 240-page catalogue (No. 63) has been published by this company. This catalogue is concerned with the company's valves, pipe fittings and fire hydrants and contains complete information as to all the numerous products manufactured by this firm. The catalogue is bound in permanent covers and is filled with facts and figures about all types of valves and their allied parts. This de luxe release contains numerous photographs and illustrations in addition to all the specifcation data. Included in this catalogue are descriptions and information concerning bronze globe and angle valves, check valves, gate valves, screwed and flanged pipe fittings, unions, plugs, hydrants, bolts, flanges, flange protectors, gaskets and discs.

Wm. F. Klemp Co., Chicago—A new catalogue describing surface armor and floor steel, has been released lately by this company. The catalogue, designed to fit perfectly into files and having a handy tab for quick reference, contains tables of safe loads, information on assembly and rcecommended fillers, together with specific information as to the company's flooring, grating, stair treads, platform flooring, decking, etc.

Lincoln Electric Co., Cleveland, Ohio—This company's "Weldirectory" contains a great amount of information as to the Lincoln system of arc welding and equipment. The publication, containing many illustrations, discusses electrodes, information and procedure pointers on shielded arc welding, and describes all the equipment and clothing manufactured by the company for arc welding work.

Metropolitan Life Insurance Co., New York City—Because of the increasing volume of business and the resulting need for building up or supplementing the existing personnel, questions of organization are in forefront of business thinking today. Hence this company has published a new report entitled "Business Organization" which contains information on certain general principles and general patterns of organization procedure. Key executives of any industry would be very much interested in this publication.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.—As an aid to engineers, designers and all others concerned with the application of small motors, this company has published its new "Small Motor Selector Guide" (F-8525), which contains essential data needed to fit the right motor type to any job. The release covers the field of small motor application from general purpose to governor controlled universal motors and from typewriter drives to belted furnace blower drives. Pictures and descriptions are included.

Worthington Pump & Machinery Corp., Harrison, N. J.—This company's bulletin (W-210-B26) contains much interesting information regarding the Worthington pressure filter for water purification. Illustrations and drawings are included in this release which also contains interesting and informative written material on the product.

BOOKS

A History of the Corrugated Shipping Container Industry in the United States—Wilbur F. Howell, the author of this book, has been associated with Robert Gair Company, Inc., New York, N. Y., since 1908, holding the office of Secretary since 1930. It is a factual presentation of data of value to anyone interested in the development of the shipping container industry. The author touched upon the Jones and Long patents, some of the pioneer manufacturers, the development of specialties, associations, the Pridham case and carrier regulations, styling and testing, machine development, and the present and future industry. The book, durably bound and containing approximately 60 pages, was published by Samuel M. Langston Company, Camden, New Jersey.

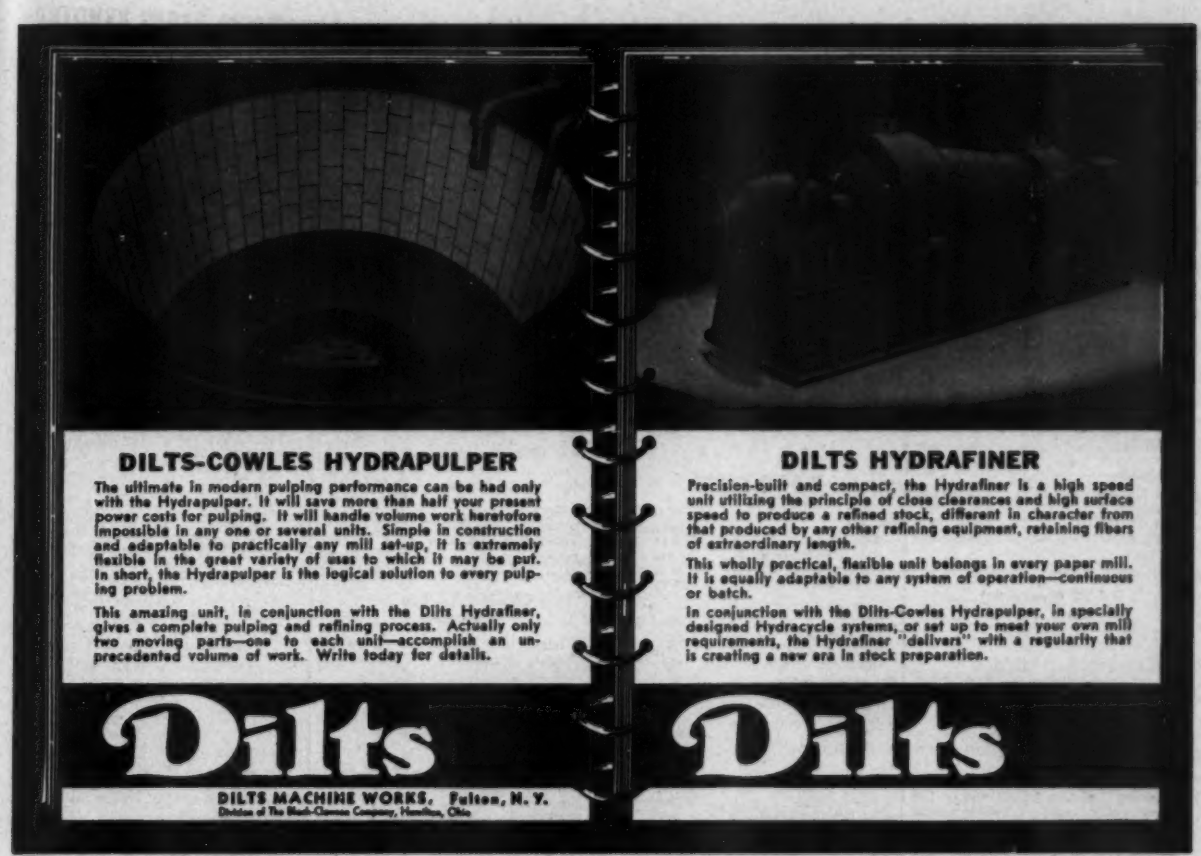
Micellar Structure of Cellulose and Its Derivatives—This work is a translation of the original article of O. Kratky in Angewandte Chemie 53, 153-62 (1940). The translation, made by Julian F. Smith, consists of 24 mimeographed pages of single space material. The article discusses the theory of individual micelles, the new micellar theory, micellar structure of natural fibers, dissolving cellulose and its derivatives, precipitation from cellulose solutions, and refining and testing the concepts previously developed. The translation appearing as Cellulose Series No. 1 of the Hooker Scientific Library, Central College, Fayette, Mo., is unbound and is priced at $1.25 a copy.

Simple Blueprint Reading—This book, published by The Lincoln Electric Company, Cleveland, Ohio, has been prepared with special reference to welding. It is a work of 138 pages (6 in. x 9 in.). Included in the text, which is concise and written for ready understanding, are 164 illustrations. The illustrations cover practical examples of drawings of a number of machine parts, pipe connections, general construction, tanks, etc. Bound in semi-flexible simulated leather cover, gold embossed, the book is priced by the publisher at 50 cents per copy postpaid anywhere in the United States, 75 cents elsewhere.

Troubles of Electrical Equipment—The second edition of this book by H. E. Stafford has been released by the publisher. It is a volume of nearly 400 pages covering symptoms, causes, and remedies of troubles of both a-c. and d-c. apparatus common to the average industrial plant. Specifically, the volume is divided into 18 chapters that deal in part with induction motors, synchronous motors, direct current generators and motors, transformers, air- and oil-circuit breakers and relays, lightning arresters, and cables. In addition, the volume treats such subjects as industrial motor control, selecting motors for industrial application, insulation-resistance tests, economic use of power, power factor, handling handling maintenance and inspection, load survey, and industrial plant lubrication. In the preparation of this second edition, errors in diagrams, formulas and problems of the first edition have been corrected; the chapter on industrial plant lubrication was rewritten; and a chapter on the determination and location of cable faults was added. Published by McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York, N. Y., the book is priced at $3.00 a copy.

The Paper Mills Directory of Great Britain and Ireland for 1940—Printing-Craft, Ltd., 18, Featherstone Buildings, Holborn, W. C. 1, London, England, has issued the 78th annual edition of The Paper Mills Directory of Great Britain and Ireland. Material in the book has been arranged in four convenient sections—papermaking and finishing, paper distribution and sales, allied and associated trades, and general trade information. To bring out the edition, according to the publisher, more than 2,000 corrections were made. Some of these corrections were made necessary by war conditions; others, to alterations in plant and equipment and other changes incident to the functioning of business. The book is priced by the publisher at 3/-, post free.

Wood Pulp Statistics (1940 edition)—This work is issued as a current supplement to World Wood Pulp Statistics as published by the United States Pulp Producers Association in September 1938. It supplies latest statistical data on United States wood pulp and paper, on world production of rayon, and on Canadian wood pulp. Spiral bound in paper cover, the publication is priced at $2.00 a copy by the United States Pulp Producers Association, 122 East 42nd Street, New York, N. Y.



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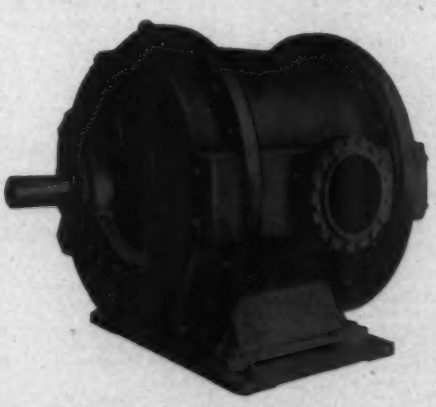

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Stitchless	.95 to 1.00
Overissue Mags	.80 to .90
Solid Flat Book	.70 to .80
Crumpled No. 1	.55 to .65
Solid Ledger Books	2.00 to 2.10
Ledger Stock—	
White	1.70 to 1.80
Colored	1.20 to 1.30
New B. B. Chips	.35 to .40
Manilas—	
New Env. Cuts	2.60 to 2.75
New Cuttings	1.85 to 2.00
Sulphite Mill Wrappers	.35 to .40
No. 1 Old Kraft	1.35 to 1.50
News—	
No. 1 Wh. News Cuttings	1.50 to 1.65
Strictly Overissue	.60 to .70
Strictly Folded	.50 to .60
No. 1 Mixed Paper	.32½ to .37½

CHEMICALS
f. o. b. shipping point

Alum (Papermakers)—	
Lump, cwt.	3.75–
Ground, cwt.	3.50–
Powdered, cwt.	3.90–
Blanc Fixe—	
Pulp, bulk, ton	35.00 to 40.00
Dry, barrels, pound	.0300 to .0400
Bleaching Powder—	
Drums, cwt.	2.00 to 3.00
Casein (Domestic Standard)—	
20-30 mesh (bags), lb.	12.00 to 13.00
80-100 mesh (bags), lb.	13.00 to 14.00
Argentine, lb.	11.50 to 12.00
China Clay—	
Domestic Filler	
Bulk (mine) ton	8.50 to 15.00
Domestic Coating	
Bulk (mine) ton	12.00 to 22.00
Imported (ship side)	
Bulk (lump) ton	15.00 to 26.00
Chlorine—	
Tank cars (wks) cwt.	1.75 to 1.90
Gelatine (silicin), lb.	.55 to .65
Glyc. (C.P.) drums, lb.	.1250 to .1300
Litharge, powd., bbl., lb.	.0800–
Rosin (Gum)—	
New York, per 100 lbs.	
E	2.42–
F	2.42–
G	2.42–
WW	3.32–
Rosin (Wood), carlots	1.40–
Salt Cake—	
Dom. bulk (wks) ton	16.00 to 17.00
Imp. bulks on dock—	
(Atl. ports) ton (Nom.)	20.00 to
Soda Ash—	
Bulk (works), cwt.	.90 to .95
Paper Bags, cwt.	1.05 to 1.25
Barrels, cwt.	1.05 to 1.35
Soda (Caustic)—Ammonia,	
Solid, drums, cwt.	2.50 –
Ground and flake, drums, cwt.	2.75 –
Sodium Silicate—	
60 deg., 55 gal. drums, (works) cwt.	1.85 to 2.00
40 deg., 35 gal. drums, (works) cwt.	.80 to 1.20
Starch—	
Pearl, 140 lb. bags, cwt.	2.95–
Pearl, barrels, cwt.	3.05–
Paper (8p.) bags, cwt.	3.06–
barrels, cwt.	3.15–
Sulphur (crude)—	
(mine) bulk, long ton	16.00 to 20.50
Talc—	
Dom. 100 lb. bags (mine) ton	14.00 to 17.25
Imp. bulk, ton (Nom.)	23.00 to –
Titanium Dioxide—	
Barium Pig., bbls., lb.	.05¼ to .05½
Calcium Pig., bbls., lb.	.05 to .05¼
Zinc Sulphide, bbls., lb.	.07½ to .07¾

CHEMICAL PULP
(Air-dry ton)

	per cwt.
Soda (Dom.) del'd. mill—	
Bleached, contract	3.50 –
Open market	3.50 –
Sulphate (Dom.) f. o. b. mill—	
Bleached	4.00 to 4.25
Kraft No. 1	3.25 to 3.50
Kraft, Southern, del.	3.25 to 3.50
Sulphate (Imp.) on dock—	
Bleached	4.50 to 4.75
Kraft No. 1	3.50 to 3.75
Kraft No. 2	3.25 to 3.50
Sulphite (For.)	
On dock—	
Prime bleached	4.00 to 4.25
Prime easy bleach	3.75 to 4.00
Prime strong unbl.	3.50 to 3.75
Sulphite (Dom.)	
Bleached, contract	3.62½ –
Bleached, open market	3.62½ –
Unbleached, contract	3.17½ –
Unbleached, open market	3.17½ –

MECHANICAL PULP
(Air-dry ton)

	per ton
No. 1 Dom. & Can. (f. o. b. pulp mill)	34.00 to 37.00
No. 1 Imp. (On dock)—	
Moist	(nominal) 43.00 to 48.00
Dry	(nominal) 45.00 to 50.00

PAPER
f. o. b. New York City

	per ton
Boards—	
Binders	73.00 to 80.00
Chip	32.50 to 35.00
Chip, sgl. mla. lined	50.00 to 55.00
Coated, white patent	
.016	77.50–
.020 and heavier	72.50–
Kraft liner	55.00–
News	32.50 to 35.00

	per cwt.
Book (eased)	
No. 1 Glossy Coat	11.90 to 13.50
No. 2 Glossy Coat	10.25 to 11.75
No. 3 Glossy Coat	9.55 to 11.00
No. 4 Glossy Coat	9.15 to 10.50
No. 2 Offset	7.70 to 9.00
A Grade M. F.	6.75 to 7.25
A Grade Super	7.00 to 7.50
B Grade M. F.	6.30 to 6.80
B Grade Super	6.55 to 7.05
B. S. & S. C. Litho	6.80 to 7.30
B. M. F. Litho	6.55 to 7.05
Ivory & India	.50 cwt. extra
Bonds (Rag Content)—	
100% Rag	
Ext. No. 1	39.10 to 46.00
100% Rag	31.05 to 36.50
85% Rag	
75% Rag	23.00 to 27.75
65% Rag	20.50 to 25.00
50% Rag	17.55 to 21.50
25% Rag	14.65 to 17.75
Regular Colors	1.00 cwt. extra

	per cwt.
Bonds (Sulphite)—	
No. 1	8.95 to 11.00
No. 2	8.05 to 9.75
No. 3	7.60 to 9.25
No. 4	7.30 to 9.00
Colors	1.00 cwt. extra
Glassine (f. o. b. mill)—	
Embossed (25 lb. up)	13.75 to 14.00
Bleached (25 lb. up)	12.75 to 12.87½
Unbleach. (25 lb. up)	11.00 to 11.25
Greaseproof—	
Bleach. (25 lb. up)	10.50 to 10.75
Unbleach. (25 lb. up)	9.50 to 9.75
Ledgers (Rag Content)—	
100% Rag	
Ext. No. 1	40.25 to 47.25
100% Rag	32.20 to 37.75
85% Rag	29.90 to 35.00
75% Rag	24.75 to 29.00
65% Rag	21.65 to 26.25
50% Rag	18.70 to 22.75
25% Rag	15.80 to 19.25
Regular Colors	1.00 cwt. extra
Ledgers (Sulphite)—	
No. 1	10.10 to 12.25
No. 2	9.25 to 11.25
No. 3	8.50 to 10.75
No. 4	8.50 to 10.25

	per ton
News—	
Rolls (Contract)	49.00 to 50.00
Rolls (Spot)	(nominal)
Sheets	58.00 –

	per ream
Tissues (Carlots)—	
White, No. 1	.97½ –
White, No. 2	.75 to .77½
Anti-Tarnish M. G.	.80 to 1.05
Colored	.87½ to 1.10
Kraft	.85 to .90
Manila	.77½ to .80
Napkins, semi-crepe (12¼ lb. to M shts.) per cs	.41 –
Napkins, full crepe and emb'sed (12¼ lb. to M shts.) per cs.	.42½ –
Toilet, Bleached (M shts.) per cs	3.80 –
Toilet, Unbleached (M shts.) per cs	3.80 –

	per case
Towels—	
Bleached	3.10 to 3.65
Unbleached	1.95 to 3.30

	per cwt.
Wrappings (Kraft)—	
Extra Quality	5.25 to 5.75
Super-Standard	4.87½ to 5.25
Northern Standard	4.25 to 4.75
Southern Standard	4.25 to 4.75
Wrappings (Sulphite and Bleached Kraft)— (Rolls, f. o. b. mill)	
Bleached papers—	
M.F.& M.G. Waxing, 20 lb. (Carloads only)	6.40 to 6.50
(10,000 lbs.)	6.80 to 6.90
Drug wrapp. 35 lb.	6.00 to 6.25
Unbleached Papers—	
Com. Grd. Butch. 40 lb.	4.50 to 4.75
No. 1 Butchers	5.00 to 5.12½
No. 1 Imit. Parch & Dry Fin.Groc.Sulphite 30 lb.	5.50 to 5.75
No. 2 Imit. Parch & Dry Fin.Groc.Sulphite 30 lb.	5.25 to 5.50
Steam Finish, 50 lb.	4.00 to 4.25
Water Finish, 40 lb.	4.50 to 4.75
Manilas—	
Envp. Mla., Sub. 16-40 (No. 1)	5.25 to 5.50
Envp. Mla., Sub. 16-28 (No. 2)	5.00 to 5.25
Envp. Mla. (Prices based on large sheets untrim'd ream-marked, in bdls.)	
Wrapp. Mla. 35 lb. up—	
No. 1	5.25 to 5.50
No. 2	5.00 to 5.25
M. G. Sulphite and Kraft (other than Waxing)	
Grade A-25 lb.	6.00 to 6.12½
Grade B-25 lb.	5.50 to 5.62½